

Machine and Tool

BLUE BOOK


A HITCHCOCK PUBLICATION


NOVEMBER • 1960




G.E.'S DR. GILBERT explains...what happened after
"Our search for further cost savings
led us into numerical program control"

a message to owners of MARVEL HACK SAW MACHINES

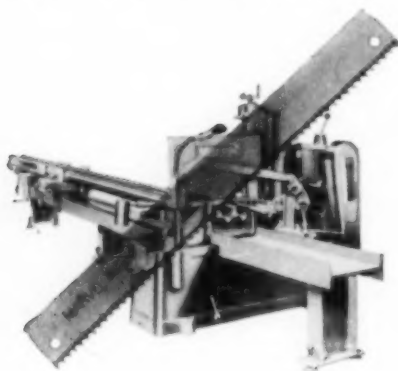
If you are the owner of a MARVEL Hack Saw Machine, check the name on the blades being used in it. If they are not MARVEL Blades, the chances are very good that you are not getting all the cutting-off speed, accuracy, and economy you paid for when you bought a MARVEL Saw.  Consider this fact. The hack saw *blade* is the cutting tool that actually

does the cutting job. If the machine is expected to deliver its full efficiency, the blade must possess a ruggedness comparable to that of the machine.  Isn't it logical, then, that the blades you use be as carefully selected as the machine itself? Here is another fact:

The MARVEL High-Speed-Edge Hack Saw Blade was designed specifically to withstand the heavy feed pressures and high cutting speeds your MARVEL Hack Saw can deliver.

 Only MARVEL UNBREAKABLE Hack Saw Blades can be safely tensioned taut enough to provide the maximum rigidity of the cutting tool necessary for accurate cutting-off; and at

the same time, protect both the operator from injury and the machine from damage that so frequently occurs with "breakable" blades.



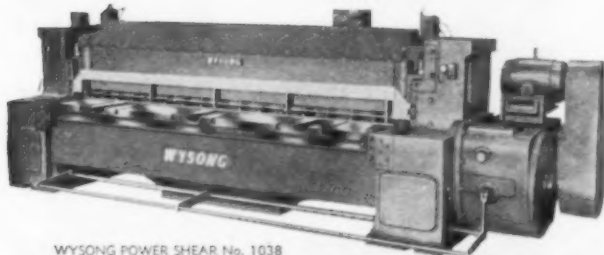
Why not be certain your MARVEL saw is delivering the high performance you had originally purchased, by using the only blade capable of utilizing the power and accuracy built into the machine? MARVEL Hack Saw Machines and MARVEL High-Speed-Edge Blades are an unbeatable combination. MARVEL High-Speed-Edge Hack Saw Blades are stocked and sold by leading Industrial Distributors everywhere.

ARMSTRONG-BLUM MFG. CO.
8700 Bloomingdale Avenue • Chicago, Illinois



**"America's finest
SHEARS and BENDING ROLLS
shown at
MACHINE TOOL EXPOSITION"**

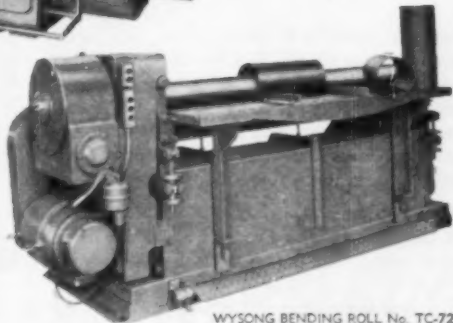
This was the comment of visitors at our booth while attending the Machine Tool Exposition in Chicago September 6-16, after comparing Wysong shears and rolls with other well-known makes on display. After comparing design... feature for feature... value for value... they too said: "buy a Wysong... it's Miles ahead".



WYSONG POWER SHEAR No. 1038

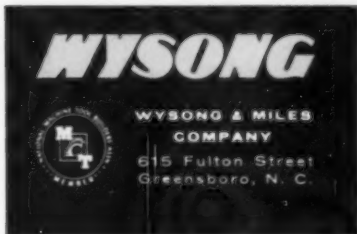
Capacity $3\frac{1}{2}$ " x 10'

Other models available with cutting lengths from 24" thru 12'; capacities from 16 gauge thru $\frac{1}{2}$ "



WYSONG BENDING ROLL No. TC-72

Models available with roll diameters of 4 $\frac{1}{4}$ ", 5", 6", 7", 8" with working lengths from 36" thru 10'.



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ALLEN



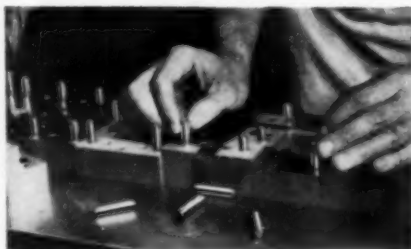
ALLEN is the dowel pin that gives you PLUSES

Your ALLEN Industrial Distributor can show you a good many ways to use ALLEN Dowel Pins, in addition to conventional uses in tool and die work. You can use them as economical roller bearings, axles, precision plugs, hinge and wrist pins—and in many other ways.

You can cut the cost of your product substantially, too—because your ALLEN Distributor can supply these strong, accurate, mirror-finished Dowel Pins in standard sizes right from stock.

Made of special Allenoy steel; surface hardened to 62-64 Rockwell C; precision ground to .0001" with micro-inch finish of 6 RMS max. Check your Allen Handbook or Catalog for detailed specs and standard sizes, or write direct for samples and technical information.

Two standard oversizes: .0002 for press fits between mating parts; .001 for repairs and holes machined oversize.



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from
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SFM

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Speed flexibility assures smooth cut . . . lengthens blade life. Precision engineered and ruggedly built of steel plate and cast iron.

Automatic Power Feed available.

Model 87
20" Band Saw

Change Blade Guide Inserts in 60 Seconds!



NEW . . .

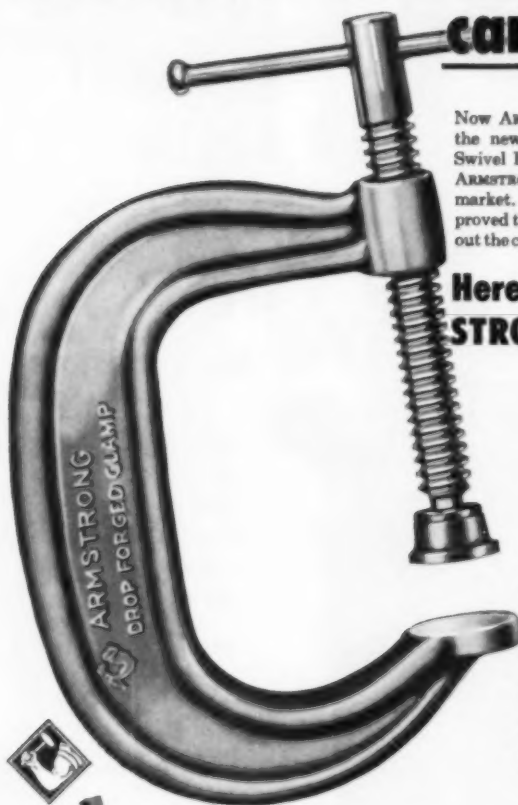
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New **ARMSTRONG** Swivel Pad can't come off



Now ARMSTRONG deep throat "C" Clamps have the new (Pat. apd. for) ARMSTRONG Ball-joint Swivel Pad. This "C" Clamp pad, developed by ARMSTRONG Engineers, is tougher than any on the market. Rigorous testing in our own plant first proved this fact, and field tests in factories throughout the country have confirmed our own test results.

Here's Why it's **STRONGER...**



The lip of the opening in the ARMSTRONG Ball-joint Swivel Pad is undercut so that when the ball of the screw is inserted, and the lip is permanently forced down, a solid steel wall is formed, inside the pad cavity, completely encircling the ball.

This wall of steel makes it impossible for the pad to come off the screw during normal use. In fact, our tests have proved that it is virtually impossible to intentionally knock the pad off with a hammer—yet the pad is free to swivel through an arc of approximately 40°.

Call your **ARMSTRONG** Distributor



Heavy Duty "C" Clamps

Medium Swivel "C" Clamps

Smaller Resistant "C" Clamps

Extra Deep Throat "C" Clamps

Top Mounting "C" Clamps

Standard "C" Clamps

Ported Clamps

Your ARMSTRONG Distributor can offer delivery from stock on this "400-Series" deep throat, drop-forged "C" Clamp with the new Ball-joint Swivel Pad. He also carries in stock the other styles of clamps in the ARMSTRONG Line—the broadest line of drop forged "C" Clamps.

ARMSTRONG BROS. TOOL CO.,

5208 W. ARMSTRONG AVE.
CHICAGO 46, ILLINOIS

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MACHINE and TOOL BLUE BOOK

Machine and Tool BLUE BOOK

WILLIAM F. SCHLEICHER, Vice President and Editorial Director;
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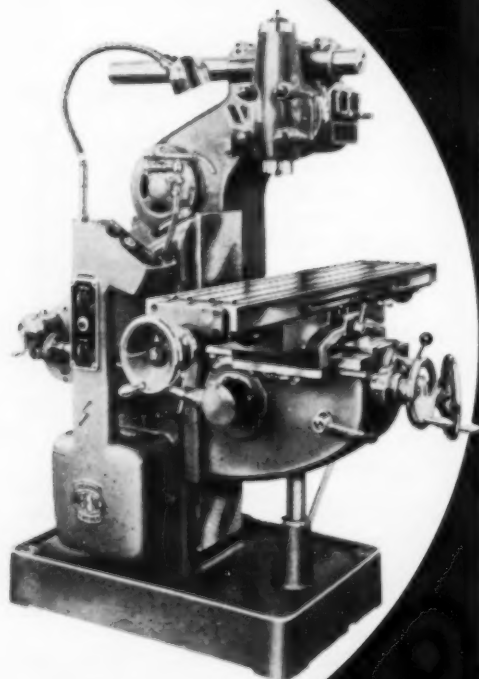
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COMBINED VERTICAL - HORIZONTAL MILLING MACHINE VHF3



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Pivot spindle head, adjustable column, precision hand scraped guide surfaces, power rapid in all directions.

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Also available—Model VHF-2 without power rapid.

SPECIFICATIONS

Table working surface (3 T-slots, upper width 16 mm.)48"x10"

Mechanical longitudinal motion of the table22"

12 longitudinal feeds, per minute $\frac{3}{8}$ "—30"

High speed, longitudinal motion, per minute75"

Mechanical cross motion of the table8"

12 cross feeds, per minute..... $\frac{3}{8}$ "—30"

High speed, cross motion, per minute75"

Mechanical vertical motion of the table19"

12 vertical feeds, per minute $\frac{3}{8}$ "—18 $\frac{3}{4}$ "

High speed, vertical motion, per minute44"

Distance from spindle center or spindle front surface to table0"—19"

Gap (when setting for vertical milling)8"

12 spindle speeds
60 cycles, 53-2400

Spindle motor4 H.P.
Feed motor0.8 H.P.

(at high speed 1.2 H.P.)

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twist

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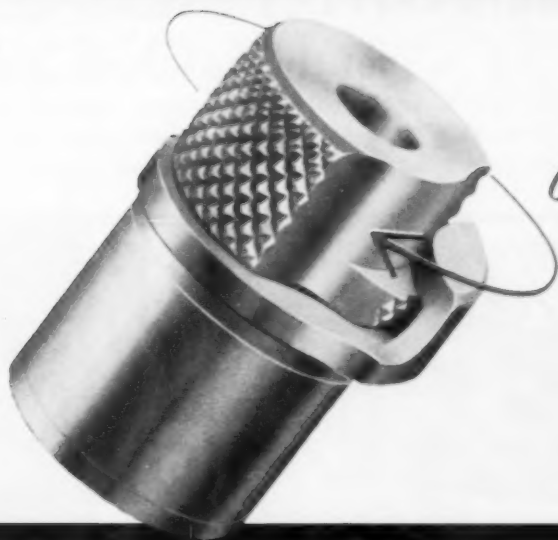


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November, 1960

7



CINCINNATI 10"
Hydraulic Universal
Grinding Machine.
Catalog No. G-577-7

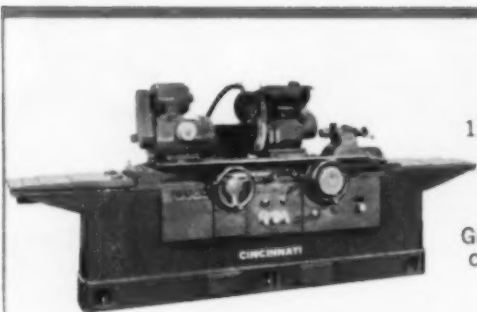


internal grinding

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CINCINNATI
12", 14" and 18"

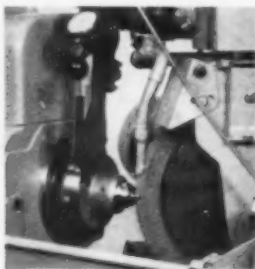
Hydraulic
Universal
Grinding Machines
Catalog No. G-663-3



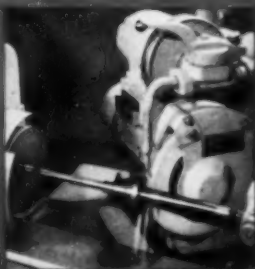
internal grinding



BUILDERS OF PRECISION GRINDING MACHINES: CENTERTYPE • CENTERLESS • MICRO-CENTRI
THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO



production grinding with
Acrasize gaging



grinding a shoulder,
wheel and drive interchanged

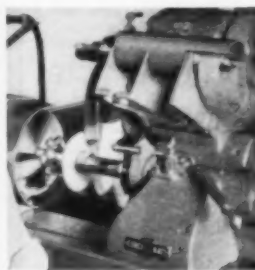


face grinding

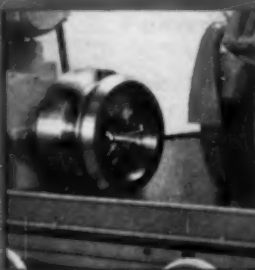
In the field of precision toolroom grinding, you can quickly lower costs and improve quality with CINCINNATI Universals. These fine machines have a high degree of built-in skill to supplement the operator's natural ability. FILMATIC grinding wheel spindle bearings, for example, automatically maintain dead-center rotation, a necessary adjunct to producing fine fin-

ishes. And consider the setup time saved by the lathe standard spindle nose on the headstock; the hinged, front mounted internal grinding head; the wide angle swivel ranges for grinding tapers, bevels and faces.

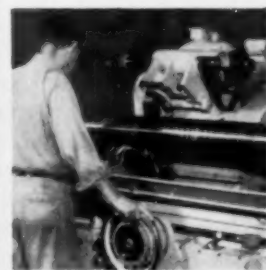
CINCINNATI Universals are by far the most versatile and dependable for your shop. Want more information? Write or telephone today for catalogs.



infeed grinding a hub



grinding a bevel



traverse grinding large part

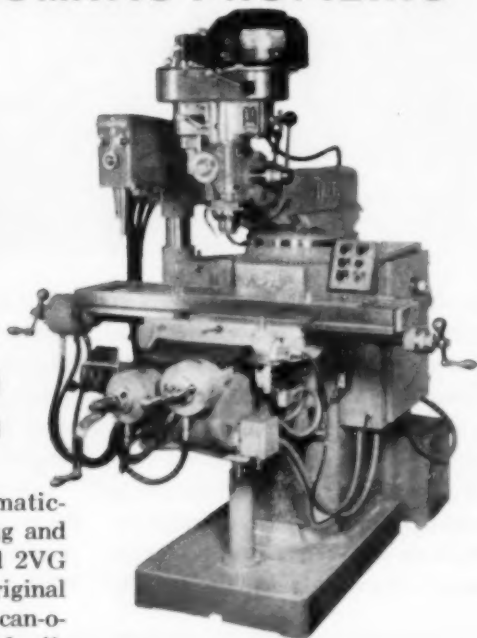
CINCINNATI

GRINDING MACHINE DIVISION

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**ACCURATE AUTOMATIC
3-DIMENSIONAL DUPLICATING
AND SEMI-AUTOMATIC PROFILING**

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Scan-o-matic adds fully automatic-hydraulic 3-dimensional scanning and profiling to the Tree 2UVR and 2VG Mills, yet maintains their full original ranges and capacities. In the Scan-o-matic system of 3-dimensional duplication the stylus follows the contour of the model operating a dual valve which coordinates the knee and table or knee and saddle motions. The Tree Scan-o-matic machine operates *automatically* for close tolerance duplication or *semi-automatically* for profiling. Special constant torque hydraulic motors drive the lead screws of the mill thus retaining the original ruggedness for heavy milling.

SCAN-O-MATIC FEATURES

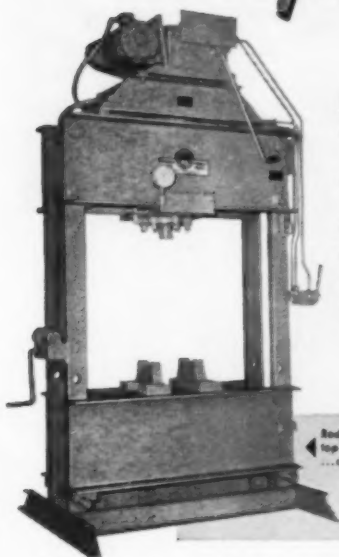
- Fully automatic
- Scans in either direction
- Uniform cutting feed
- Constant stylus deflection
- Automatic shutdown



TREE TOOL & DIE WORKS
RACINE, WISCONSIN

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A *Rodgers* Shop Press is **BEST** for YOU!

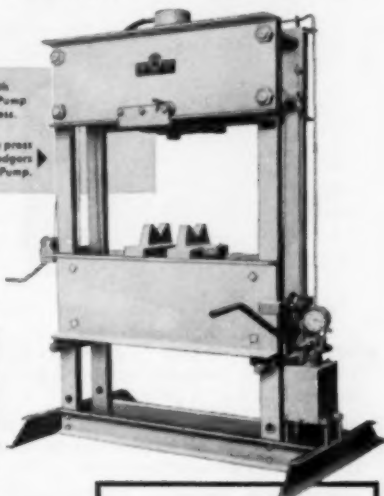


Rodgers 100 ton shop press with top mounted Greenlee Power Pump... cylinder travels width of press.

Rodgers 100 ton shop press with Rodgers 2 speed Hand Pump.

HERE'S WHY:

- **LONGEST RAM TRAVEL** with maximum hydraulic power throughout entire stroke.
- **REMOVABLE CYLINDER** for independent hydraulic power away from the press.
- **CYLINDER TRAVEL** full width of press, either way.
- **OPEN ENDS** allow long pieces to extend through sides of press.
- **EXTRA WIDE** inside work space to handle bigger jobs more easily.
- **GREATER STRENGTH** with heavy bar stock sides and pins—bearing blocks support bolster to give uniform distribution of pressure.



WHEN YOU INVEST in a shop press it is more important to compare performance than initial cost!

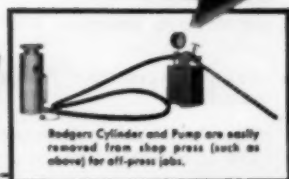
Rodgers Shop Presses are designed and built for the most versatile service, and longest trouble-free life. In the shop they handle hundreds of diversified jobs... pressing, bending, straightening, assembling. For field work the Rodgers cylinder and pump are easily removed from the press, making an ideal portable power unit for jacking, lifting, heavy shaft removal and similar work.

Rodgers produces the most complete line of shop presses available—capacities from 60 to 400 tons—in varied standard models with power pumps, top mounted or placed at the side—or hand pumps with 2 or 3 speeds.

When you compare shop press performance and cost you will find a Rodgers is best for you, too. Ask your Rodgers Representative for complete details—or write us.

SEND FOR NEW CATALOG...

It gives useful information and complete specifications.



Rodgers Cylinder and Pump are easily removed from shop press (such as above) for off-press jobs.



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1185 DOLLARS BUYS THIS CLAUSING 1-1/16" Collet Capacity Lathe



and look what you get

- **VERIFIED ACCURACY** — guaranteed by 16 precision tests documented for you in reports accompanying each lathe.
- **FLAME HARDENED BED WAYS**—"accuracy protection" which costs many dollars more on other lathes.
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- **"ZERO PRECISION" TIMKEN SPINDLE BEARINGS.**
- **SHAVED GEARS**—another CLAUSING "exclusive" assuring greater accuracy and smoothness.
- **BIG CAPACITY**—No. 5418 (illustrated) has 12 3/4" swing, 23" between centers, 10-speed ball bearing countershaft. Takes up to 1 1/2 HP motor, extra. Also available with 35" and 48 1/2" centers, and with variable speed drive, clutch and brake, L-00 spindle.

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Also investigate the all new lightweight, compact portable balancer for in place precision balancing of assembled machinery, on the job.

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*703	½ lb. to 500	½" to 44"	4¼" to 55"	0.01 inch-oz.
*704	½ lb. to 1000	½" to 44"	4¼" to 55"	0.01 inch-oz.
*708	1 lb. to 5000	1" to 68"	7" to 83"	0.04 inch-oz.
Special	20 pounds to over 50,000 pounds—state requirements.			



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"Vectormatic" taps are absolutely uniform, with keen cutting edges that insure longer service life than any other tap on the market. For fast, economical, exact tolerance tapping, order "Vectormatic." Call your Morse Franchised Distributor today... your only source for patented Morse "Vectormatic" taps.

Patent No. 2929172 granted March 22, 1960.

2076

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This roll looked perfect...

until SUPERFINISH revealed these defects!

Everybody said it was as perfect a finish as you'd ever see. A 12" steel roll ground down to a smoothness of less than 2 micro inches—dazzlingly reflective from end to end. Not a visible defect—on the surface.

But when SUPERFINISHING began, some interesting marks appeared—longitudinal flat spots—defects produced by the prior operation and then covered up by the heat of grinding.

SUPERFINISH brings these hidden troubles out in the open—out where you can see them and recognize the cause. And if your troubles are not too serious, SUPERFINISH can correct them economically and fast.

If you have fine finish requirements it will pay you to write for our new Superfinish Catalog.



GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

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Now...Type S-3 surface with 150 fpm table

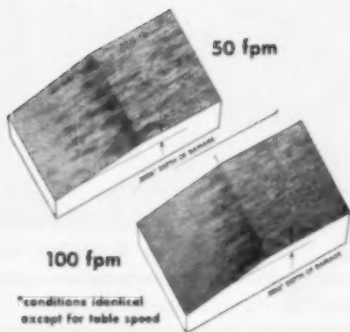
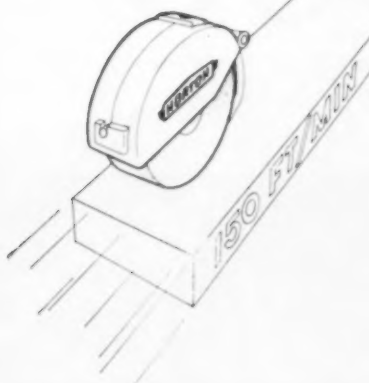
*for faster production than
ever before!*

Available in 6" x 18" and 8" x 24" sizes. Both sizes are equally fast, cool, accurate on long production runs or a wide variety of toolroom grinding. Taller workpieces are easily handled by the 15" vertical capacity of the 6" S-3, and 13 $\frac{3}{4}$ " capacity of the 8" S-3 Grinder. Other job-proved features include a two-speed .0001" increment hand wheel, assuring accurate vertical speed and fast positioning . . . contoured splash guards, for better sighting and loading.



NORTON PRODUCTS: Abrasives • Grinding Wheels • Machine Tools • Refractories • Electro-Chemicals — **DEB MANNING DIVISION:** Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

grinders speed...



You Get Better Quality Work with Norton Type S-3 surface grinders, thanks to their faster table speeds, which reduce heat damage. The above test samples show how faster table speeds result in cooler grinding.

MACHINE TOOL DIVISION: Grinding and Lapping Machines — **G & L DIVISION:** Shapers • Gear Cutting Machines • Gear Induction Hardeners

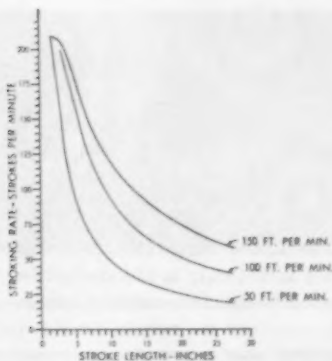
Long popular for their pace-setting table speeds up to 125 feet per minute, Norton Type S-3 surface grinders have given complete proof of their ability to finish workpieces smoother, faster, at lower cost.

Now S-3 grinders are also available with table speed stepped up to a new high of 150 feet per minute — enabling you to finish flat faster than ever, with cool-running action that saves time and money on every job.

Get the whole story from your Norton Man, a trained specialist who can help you get better grinds at lower cost. Or ask for Catalogs 1982 and 2128. **NORTON COMPANY, Machine Tool Division, Worcester 6, Mass.** District Offices: Worcester, Hartford, Cleveland, Chicago, Detroit. *In Canada:* J. H. Ryder Machinery Co. Ltd., Toronto 5.



**75 years of... Making better products
...to make your products better**



Calculate Your Savings from this production rate chart. Grinding time is reduced in proportion to the increase in stroking rate. The higher speeds also greatly increase the rate of stock removal.

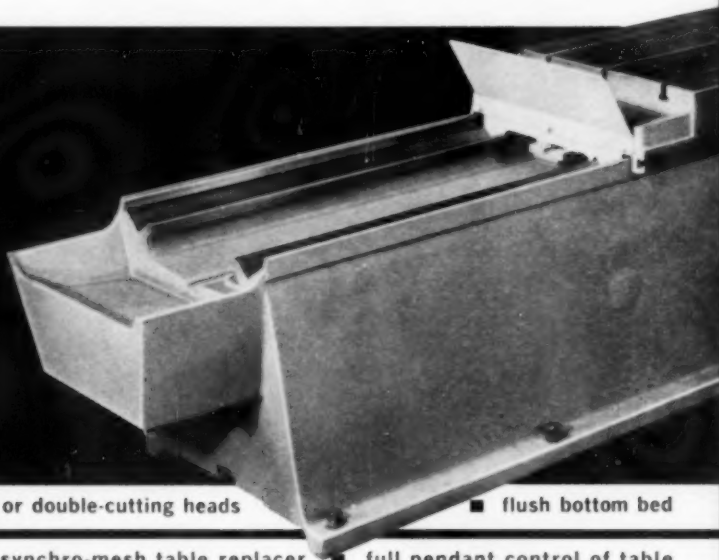
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imagine

buying a **GRAY** planer for only

\$30,660

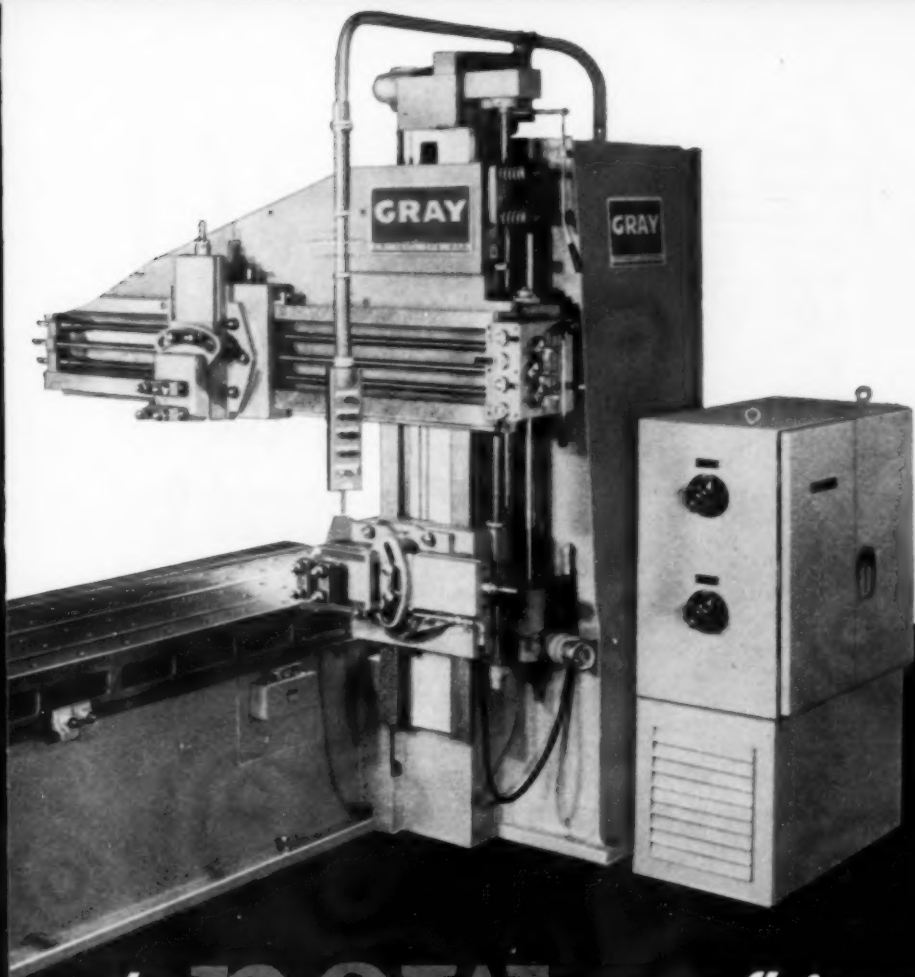
above basic price includes 30" x 6" planer, one rail head, electric drive and controls



- available with single or double-cutting heads
- flush bottom bed
- new Gray knee
- synchro-mesh table replacer
- full pendant control of table
- Gray Safety nut
- full floating drive shaft
- quick acting saddle and slide clamps
- abutment tool aprons
- non-shock pneumatic tool lifters
- infinite feed range



technical bulletin available



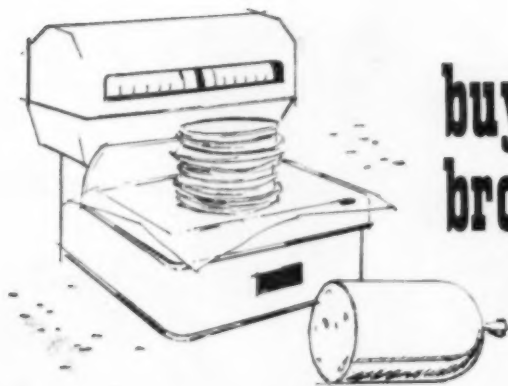
the new 30"-36"-42" flying scot

- square locked throughout ■ knee and rail counterbalance ■ pyramid side walls on bed
- vee ways ■ gray non-metallic ways—optional ■ maximum capacity—table width
- 'reservoir' lubrication ■ high table speeds ■ duplex tables optional ■ new column
- helicone transmission ■ space saver drive ■ table safety stop ■ forced lubrication

horizontal milling and boring machines
planers
planer type milling machines

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CINCINNATI, OHIO

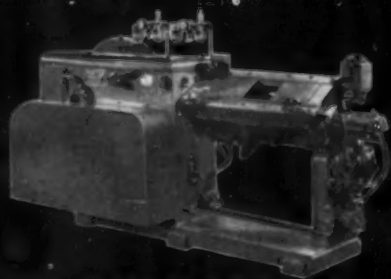
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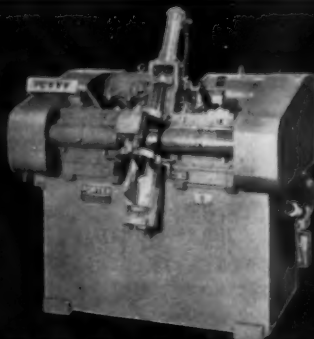
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Prominent bearing manufacturers have found that they get more for their money with Porter Broaching Machines. Not only is the initial investment much smaller, but these machines maintain production and tolerance requirements with less down-time than most other bearing broaches. Buying broaching by the pound makes sense . . . adds up to important dollars when the Broach Machine is from C. O. Porter.

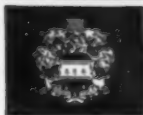
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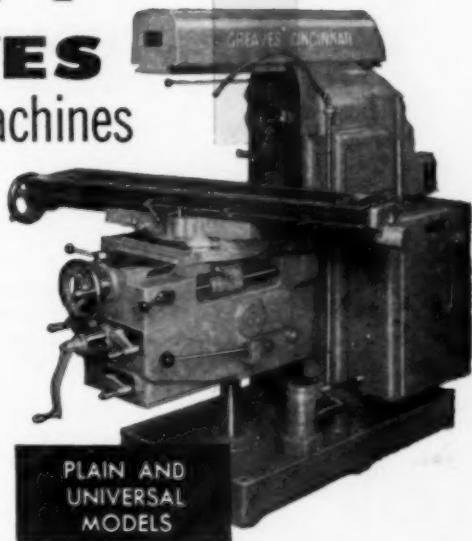
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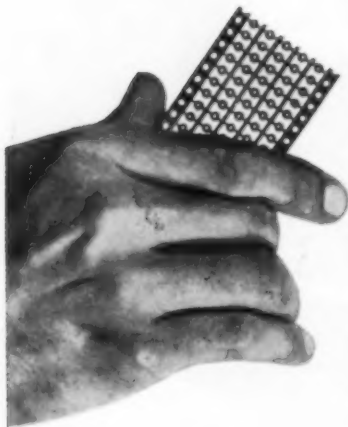
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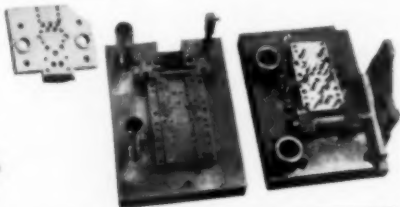
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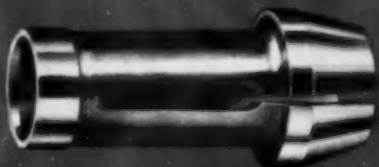
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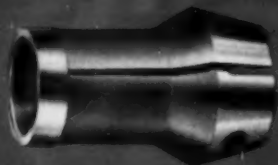
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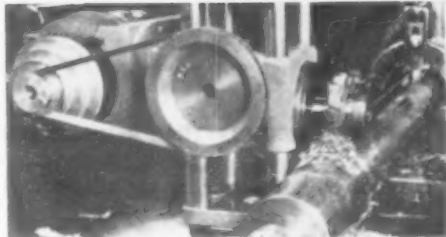
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**A FEW OF MANY POSSIBLE RIVETING
HEAD POSITIONS THAT CAN BE USED**



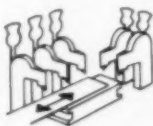
Rotating fixture showing suggested arrangement of riveting heads.



Riveting heads can be positioned for operations on flat or curved assemblies.



Conveyor Belt permits multiple setting on both sides of an assembly.



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for new low costs

For years assemblies of metal and non-metal, or a combination of both, have been fastened most economically with semi-tubular rivets. Now even lower costs are possible with Chicago Rivet's thin-nose riveting heads. Pneumatically operated and electrically controlled, they can be grouped in clusters on one or more planes and will set rivets as close as $\frac{13}{16}$ " apart. Riveting heads may be repositioned and used again on new assemblies.

CUSHIONED RIVETING REDUCES BREAKAGE. Pneumatic riveter up-sets rivet with squeezing action, minimizing breakage and automatically compensating for slight variation in assembly thicknesses.

*No obligation for the suggestions
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RIVET CATALOG describes 1388 standard tubular and split rivets, 25 single and multiple motorized automatic rivet setters.

Chicago Rivet & MACHINE CO.

947 So. 25th Ave., Bellwood, Ill. (Chicago Suburb) • Branch Factory: Tyrone, Pa.

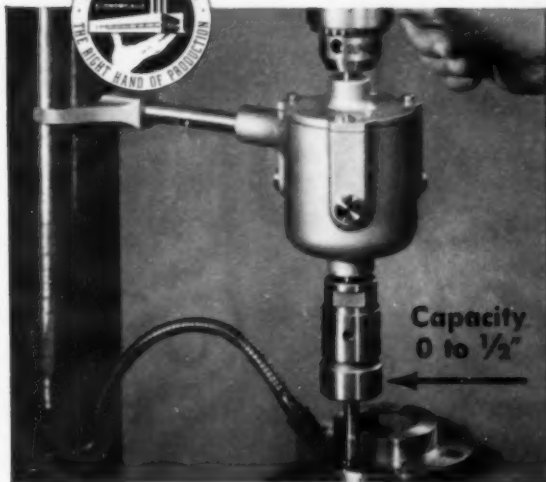
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Supreme VersaTAPPER

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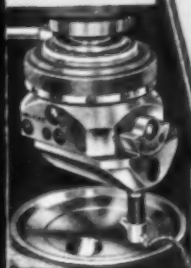
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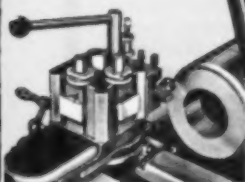
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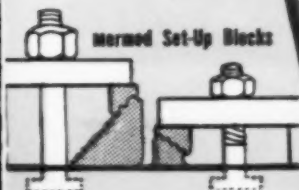
Doni Quick-Change
Precision Multi-Toolholder



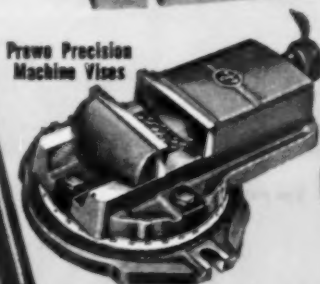
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All-Purpose
Vises



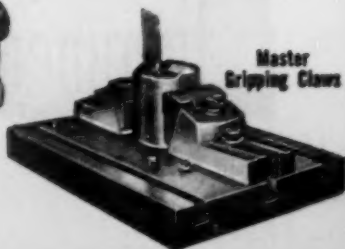
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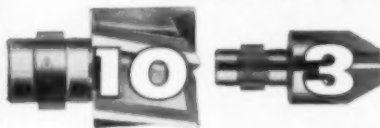


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10 hand-detachable CTW Counterbores for #6 through $\frac{1}{8}$ " dia. screw heads.

3 self-centering, hand-detachable CTW Countersinks.



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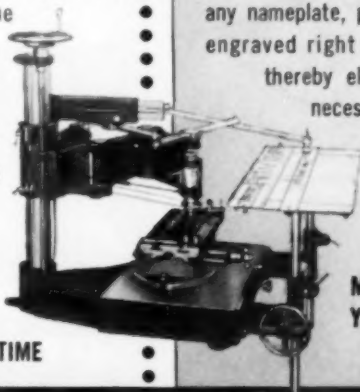
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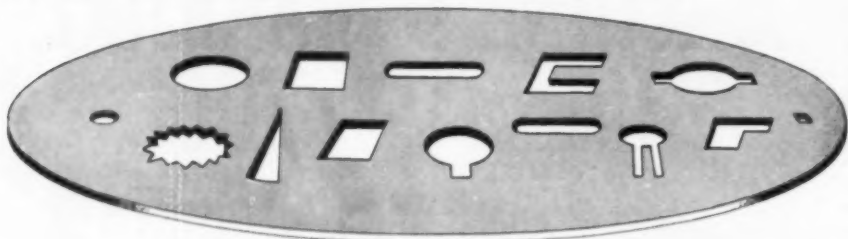
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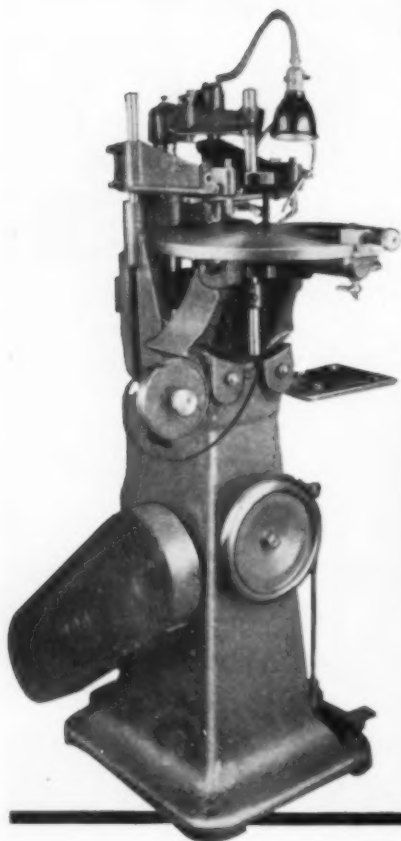
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Lucas provides

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and table.




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Lucas automatic power positioning
automatically repeats 
automatically repeats 
automatically repeats 
to $\pm .0001$. . .

A simple, completely reliable system of dial indicators, end measures, and electrical controls automatically disengages rapid traverse, engages the fixed, constant-rate power feed and precision stops the unit at predetermined settings. Automatic power positioning assures the highest order of repetitive accuracy with an absolute minimum of operator attention.

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Inspection with a height gage and setting master previously took two days and did not determine out-of-round condition. The Sheffield gage reduced the time to six hours including set-up and cooling out—and checked for out of roundness as well. Over-

all accuracy of the gage has proved to be within .000075 on both horizontal axes and in the 10° vertical range. Repeatability is within .000010.

100% of the parts which passed inspection on this Coordinate Measuring Machine proved to be perfect in assembly, test, and field use. Short production runs of parts that vary widely in size and hole location, are easily handled.

Write for catalog number P-193 or check with your nearby Sheffield representative on your gaging requirements.

NEWS: Before 11:00 a.m. on the first day of the NMTB Exposition in Chicago, September 6, 1960, a Fort Wayne, Indiana manufacturer bought a similar machine being demonstrated in the Sheffield booth. Additional orders continue to come in.

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SHEFFIELD
Corporation
Dayton 1, Ohio

A subsidiary of The Bendix Corporation

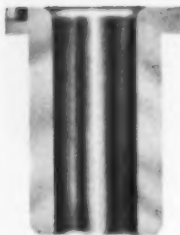
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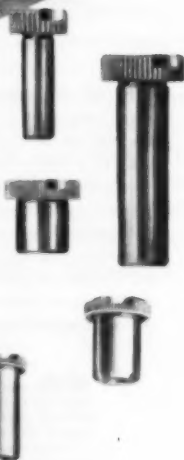
The superfinishing of Universal Drill

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Standard sizes and lengths in stock for immediate delivery. Contact the office nearest you—Universal Engineering Sales Co., 1040 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis.—or our home office.



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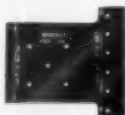


NEW STRIPPIT FLEX-O-DRILL

Are you looking for a way to reduce layout and template making time? Other manufacturers of sheet metal products and printed circuits have cut that time in half with the Strippit Flex-O-Drill.

This table-type, extremely accurate machine drills, reams, center punches and scribes *without* base line drawings or vernier height gauges. Positioning of the bridge and drill carriage is done with adjustable steel tapes calibrated to 0.100". Micrometric gauges then bring the setting to the nearest 0.001". Lead screws are precision ground and engaged only during micrometric gauge settings, thus speeding adjustment and minimizing wear. Capacity is 1/4" mild steel—up to 24" width—any length.

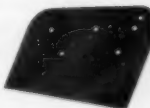
Anybody who can read blueprints and knows something about layout practice can learn to work the Strippit Flex-O-Drill in a few minutes. We'll be happy to prove this with an actual demonstration at your plant. Write for information today.



A typical Strippit Flex-O-Drill drilled template.



A typical Strippit Flex-O-Drill scribed layout.



A typical Strippit Flex-O-Drill production piece.

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Delta 15" Drill Press, also 20", 17", 14" and 14" Super-Hi Sensitive. Available in floor, bench, and multiple spindle models.

DELTA INDUSTRIAL TOOLS

another fine product by

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Heller

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HIGH SPEED STEEL
metal cutting
BAND SAWS

TAKE THE
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An early order for welded-to-length, protectively packaged Heller Ultra High Speed Steel Band Saws from your nearby Heller Distributor is the wisest and safest bet you'll ever make. Prompt delivery is also guaranteed!



HELLER TOOL CO.

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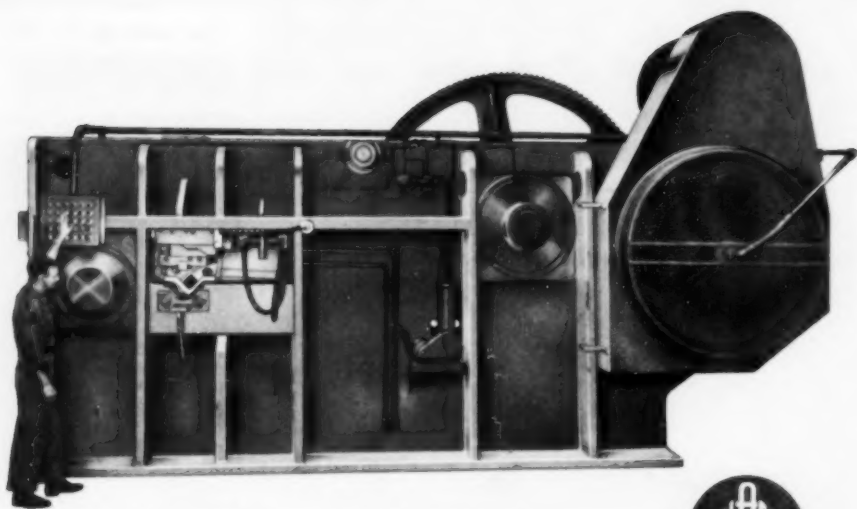
America's Oldest File Manufacturer
NEWCOMERTOWN, OHIO
Subsidiary of Simonds Saw and Steel Co.

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November, 1960

37



HILL ACME HEAVY DUTY BAR-BILLET SHEAR

for production cutting of heavy billets



SIMPLE DESIGN

The No. 1200 HILL ACME BAR-BILLET shear cuts large diameter squares of various tensiles. The basic principle of the lever and fulcrum is employed to insure maximum efficiency with low power input.

HIGH PRODUCTION

With a free running speed of 26 cuts per minute the production of square, accurate lengths will appreciably reduce cutting costs.

VERSATILE

Knives will accommodate many sizes of rounds, flats, squares or special shapes without the necessity of knife change.

LOW COST

Initial machine cost is attractive and maintenance cost comparisons are impressive.

PROVEN EFFICIENCY

Now proven through four years of successful operation in nationally known plants. Available with fully automatic, semi-automatic or hand feed.

SIZE RANGE

HILL ACME BAR-BILLET shears are made in a range of sizes to efficiently accommodate every commercial requirement. Available in either right or left hand models.

Bulletin BB-59 gives complete details.

The
HILL ACME
Company

Also manufacturers of:

ROTARY SHEARS • "CANTON" ALLIGATOR SHEARS • HILL HYDRAULIC SURFACE GRINDERS • GRINDING & POLISHING MACHINES • "ACME" FORGING • TAPPING MACHINES • "CLEVELAND" KNIVES AND SHEAR BLADES • MECHANICAL LIFTERS

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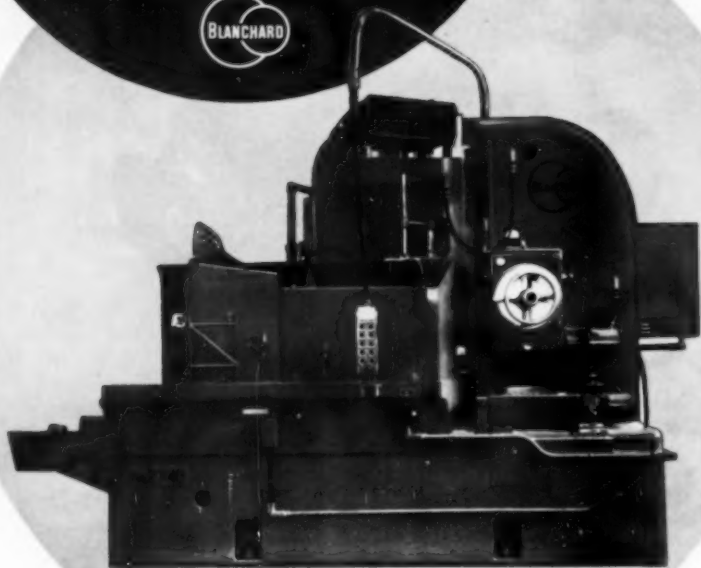
THE PIPE MACHINERY COMPANY 29100 Lakeland Boulevard • Wickliffe, Ohio • Greater Cleveland

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NEW

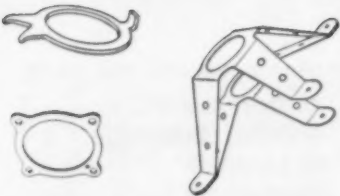
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that give you high-speed, precision grinding at lower-than-ever
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I know we make the best bushings you can buy, but if delivery holds up your job, where are you?

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they turn in top performance to turn out top results

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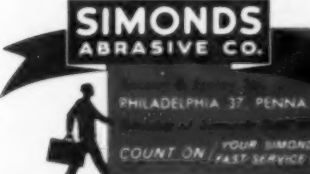
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and know your size, shape, and grade are

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- ✓ every type needed for 96% of all tool steel applications
- ✓ easy selection of the proper tool steel based on its individual characteristics
- ✓ stock shipment of grade and size assured at selection time



the Proper Tool Steel for any Application

Available with the A-L Steelector Program

easy answer to an old problem

Starting right now, the common problem of selecting the right tool steel for any job can become a thing of the past. With A-L's new STEELECTOR Program, you can make a *first time choice* of the proper grade for any application . . . and make it **FAST**, almost at a glance.

eliminates guesswork

The STEELECTOR is **ACCURATE**, eliminating guesswork, trial runs, and expensive mistakes. And best of all, the STEELECTOR gives you a choice of tool steels that are **AVAILABLE** . . . in stock, right now! And they'll *stay* available . . . with a new, increased stocking program. STEELECTOR Grades are stocked according to a study of today's needs and will be reviewed periodically to fit changing requirements.

here's how it works

In the new program, a STEELECTOR Card covering each group of steels (Tool Room, Hot Work, and High Speed Grades) will help you select one particular grade as the best for your application. The STEELECTOR presents five basic tool steel properties—Abrasion Resistance—Toughness—Size Stability—Machinability—Red Hardness—as bar graphs, with the length of the bar showing the extent of each property in every STEELECTOR Grade. Find the properties most important to you and, by inspection, pick the grade with the characteristics you need.

availability assured

There is a separate Data Stock List for each STEELECTOR Grade, showing its complete range of warehouse stocks, as well as technical



data and basic application information. So, you can be sure the grade, size, and shape of your choice is in stock.

quality assured

And you can count on Allegheny Ludlum quality in every STEELECTOR Grade. They are selected from the complete line of A-L Tool Steel and made under the rigid quality control standards of all A-L products.

details available

It's all explained in the colorful A-L Tool Steel STEELECTOR Booklet, which includes STEELECTORS for the Tool Room Grades, Hot Work Grades, and High Speed Grades, and explains the Data Stock Lists for every STEELECTOR Grade. Ask your Allegheny Ludlum Sales Representative for your copy, or write: Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pa. Address Dept. Ins. 7.



PROGRAM



ALLEGHENY LUDLUM

Tool Steel warehouse stocks throughout the country

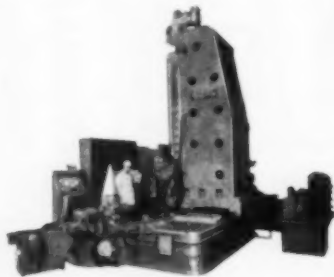


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Numerical Control Solved These Tough Production Problems

Problem: *Drill and tap oval, conical, and cylindrical sections for missile components.*

Solution: A Barnesdril, 2-spindle tape-controlled unit with four-motion-control, including a head that tilts to 15° plus or minus off horizontal center. Capable of handling parts to 36" diameter and 72" high, this unit gives $\pm .003$ " positioning accuracy with repeatability to $\pm .0005$ ". Holes can be spaced



evenly or unevenly. Standard 8-channel tape also controls tool changes, coolant selection, rapid approach and return, sensing, etc. Rotary table indexes 360°.

Problem: *Reduce set-up and machining time on jet engine casings requiring 3 different hole sizes and up to 4 operations per hole.*

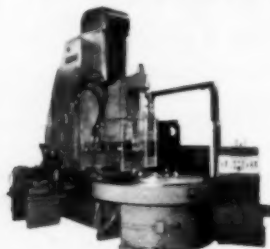
Solution: A 4-spindle, 2-motion Barnesdril numerically controlled unit completes rough drilling, rough facing, finish boring, and generating front and back parallel faces on 248 holes in 4½ hours... a 74% savings



in set-up and machining time. Individual spindles are tape-controlled to operate from 3 different feed-out ratios, entirely eliminating tool changes. The machine has the ability to select exact position, hole size, and cutting depth quickly, and with extreme accuracy. Positioning is guaranteed to .003", depth to .001", and repeatability to .0002", making it a highly flexible production machine for cylindrical parts up to 50" in diameter and 40" in height.

Problem: *Cut production costs on a variety of boiler plate and bolt circle work.*

Solution: A Barnesdril, numerical control unit cuts production time by 47%. This



is a single-spindle drilling machine with vertical spindle travel and a rotary indexing table with capacity to 50" diameter and 42" in height. Operations include combination drilling-countersinking, drilling-counter-boring, straight drilling, reaming, counter-boring, and countersinking.

Problem: *Informing every cost-conscious metalworking executive of other Barnesdril advances and advantages in tape control machining.*

Solution: Write, wire, or call for complete information. We have detailed reports on the above machines.



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852 Chestnut St., Rockford, Illinois
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"no smoking—and no dermatitis!"

You'll get immediate economies and you'll improve working conditions when you put Cimcool S2* on your metal cutting jobs.

Here's another dramatic Cimcool success story—
company name on request!



FOR 100% OF ALL METAL CUTTING JOBS

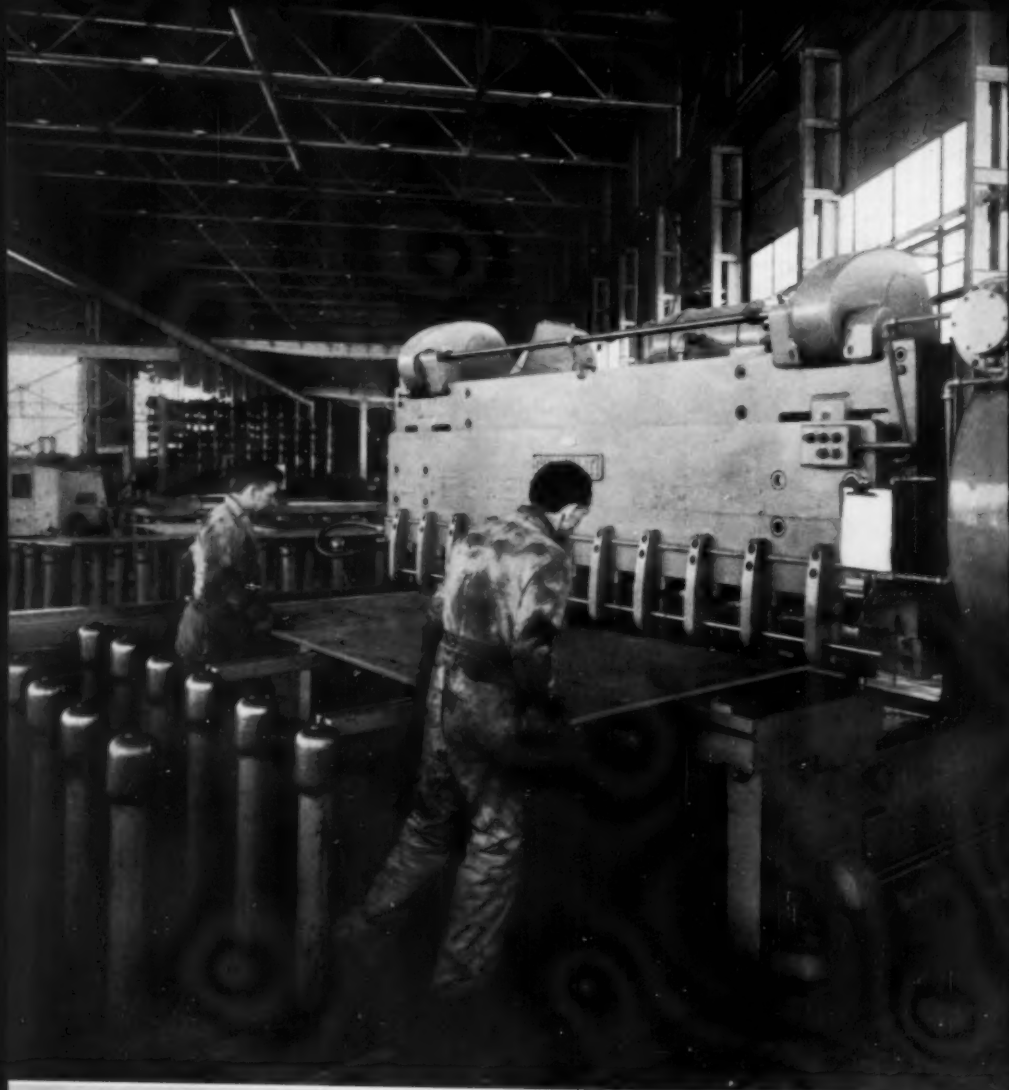
Production-proved products of The Cincinnati Milling Machine Co.

CIMCOOL S2 Concentrate — The pink fluid which covers 85% of all metal cutting jobs.
CIMPERIAL* — Newest in the famous, industry-proven line of Cimcool,* Cutting Fluids.
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ALSO — **CIMCOOL Tapping Compound** — **CIMCOOL Bactericide** — **CIMCOOL Machine Cleaner**.

For full information on the complete family of Cimcool Cutting Fluids, call your Cimcool Distributor. Or contact Cincinnati Milling Products Division, Cincinnati 9, Ohio.

*Trade Name Reg. U. S. Pat. Off.

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THIS CINCINNATI® **shears heavy plate**

Paragon Bridge & Steel Co. cuts costs as it cuts heavy plate with this Cincinnati Shear:

- Operators cut production time with rapid, easy gaging and adjustment. They don't have to change knife clearance to cut different thicknesses of material.
- The Cincinnati Shear gives them unusual versatility; enables them to do square shearing, notching, and slitting.
- They get such accuracy that they can trim an edge to one-half the thickness of a sheet! This results from such Cincinnati features as hydraulic hold-downs low rake to upper knife; inclined ram; all-steel interlocked construction.
- Extra-size, four-edge knives.

These cost-reducing features are available on all Cincinnati Shears. See Sweet's insert.

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uggedness and accuracy of a Cincinnati Shear keep costs down in the fabrication of these big bridge beams. (Photos Courtesy Paragon Bridge & Steel Company, Novi, Michigan.)

Shapers / Shears / Press Brakes

THE **CINCINNATI**
SHAPER co.



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In Scotland: The Cincinnati Shaper Co., Ltd., Glasgow

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With Faster, Cleaner **MANHATTAN CUT-OFF WHEELS**

Every Manhattan Cut-Off Wheel is custom-bonded for the specific cut-off job—whether you work with hardened or soft steels, light gauge tubing, or critical alloys. And custom bonding means safe, fast, clean, cool cutting over sustained periods . . . saves you both time and money. Recent Manhattan developments in both rubber and resinoid bonds assure this greater cutting efficiency . . . and longer life for the wheels.

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RM-1059

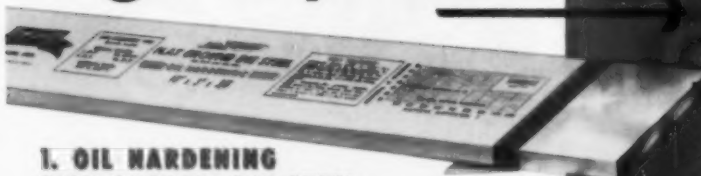


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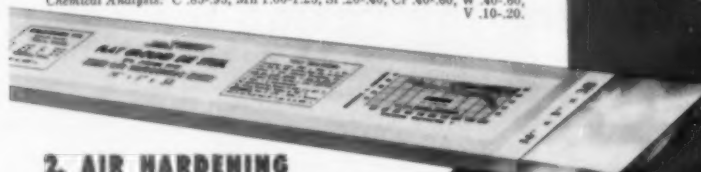
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gives you all



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Simonds quality-controlled tool steel . . . precision ground . . . ready-to-use . . . comes in 1001 stock sizes for 1001 uses: punches, dies, machine parts, small tools, etc. Spheroidize-annealed for best machinability. 18" and 36" lengths . . . flats and squares . . . individually packaged. A.I.S.I. or S.A.E. Type No. O1. Chemical Analysis: C .85-.95, Mn 1.00-1.25, Si .20-.40, Cr .40-.60, W .40-.60, V .10-.20.



2. AIR HARDENING FLAT GROUND DIE STEEL

This 5% chrome, spheroidize-annealed tool steel has exceptional wear-resistant qualities yet is easy to machine and heat treat. Ground to accurate dimensions . . . suitable for a multiplicity of uses . . . individually packaged in a wide range of stock sizes . . . flats and squares . . . standard 36" lengths (18" lengths also furnished, if desired). A.I.S.I. or S.A.E. Type No. A2. Chemical Analysis: C .95-1.05, Cr 5.00-5.50, Si .30-.50, Mn .50-.70, Mo .90-1.10, V .20-.30.



3. and the NEW LOW CARBON FLAT GROUND STEEL

Here's a fine-grained, forging quality, silicon-killed steel that offers important savings on jigs, fixtures, patterns, stripper plates, punch pads, die plates, die-blocking slabs . . . and parts that don't require heat treatment, or in some cases just case-hardening. This new line of low-cost steel rounds out the Simonds line of Flat Ground Steel, has equally fine finish, with excellent welding quality and machinability. Furnished in a wide range of flats from $\frac{1}{8}$ " to $1\frac{1}{2}$ " thick and $\frac{1}{2}$ " to 16" wide, and in squares from $\frac{1}{2}$ " to $2\frac{1}{2}$ ". All sizes come in standard, ready-to-use 24" lengths, individually packaged. Typical Chemical Analysis: C .18, Mn .50, Si .20, S .04, P .04.

Factory Branches in Boston, Chicago, Birmingham, La., San Francisco and Portland, Oregon
Canadian Factory in Montreal, Que., Simonds Division, Simonds Steel Mill, Lockport, N. Y.
Roller Tool Co., Newcomerstown, Ohio
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How Much Are You Paying for Holes?

Producing openings in low quantity work can be costly and time consuming, or it can be a simple, high speed operation—the difference is a Wiedemann Turret Punch Press.

Only a Wiedemann gives you:

1. the speed of a punch press.
2. the immediate availability of a variety of punches and dies in a turret—no setup.
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Take a closer look at the savings you can expect with the Wiedemann Method. Send drawings of your work for time study and write for Bulletin 301.



* Many Wiedemann users are selling holes profitably at a penny apiece.

RA-41P Wiedemann
15-ton capacity
28" throat depth

Other models from 4 to 150 tons

TYPICAL WORK PRODUCED ON WIEDEMANN TURRET PUNCH PRESSES

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- Electrical panels, switchgear, housings, cubicles and components.
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- Pre-production prototypes.
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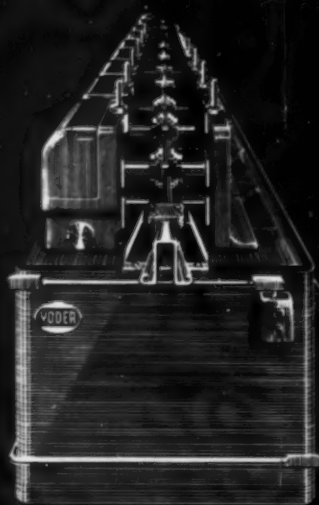
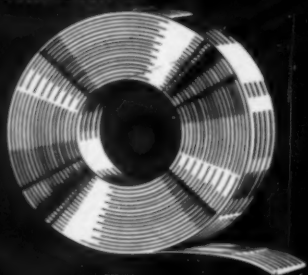
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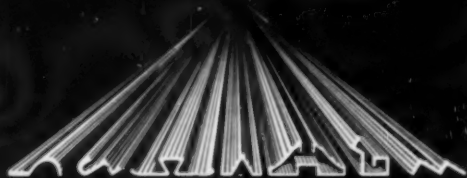
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... from start



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YODER ROLL-FORMING EQUIPMENT

Profits are available to you through the production of many shapes in metal... made with precision and economy on Yoder Cold Roll Forming Equipment.

Produce tubular, ornamental or structural shapes from a variety of metals in widths from a fraction of an inch up to 80 inches or more, and in stock up to $\frac{3}{4}$ " thick. Your investment is comparatively modest, and with proven low operating costs, will give you one of the most profitable operations in your plant.

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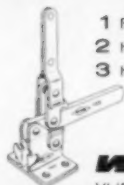


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80 models and sizes...

*made better three ways to
give more positive holding,
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THESE PARTS ARE BEING PRODUCED
AT SPEEDS OF 90 TO 250 PCS/MIN



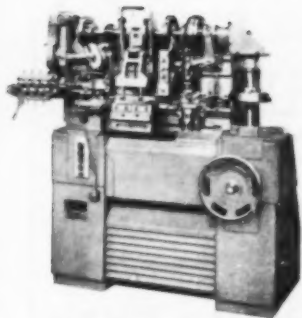
PROFIT-TREE!

These are formed parts produced in single automatic operations on the revolutionary new Torrington Vertical 4-Slide.

With precision and speed, the Verti-Slide has replaced as many as five and six progressively tooled presses in the production of a complex part. Normal secondary operations such as welding are being done in one continuous automatic operation in excess of 100 pcs/min.

If you make or buy complex wire or strip parts, the Verti-Slide method offers dramatic reductions in production cost. Less parts handling, in process inventory, machine space—all mean greater profits to you.

Write or call for field technical data or a Torrington Sales Engineer.



THE TORRINGTON MANUFACTURING COMPANY

MACHINE DIVISION Torrington, Connecticut

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SUPERIOR MAKES HONING POSSIBLE AT LOWER COST

MODEL VH SUPERIOR HONING HEAD



Adaptable to most drill presses. Designed for honing work too heavy to hold on machine, and to have all the convenience of operation of Superior Honing Machines. Range $\frac{1}{8}$ " to 3". Size dial on bottom of head permits the increasing or decreasing of size while in operation.

No stopping of spindle necessary. Lever releases stone from work and expands stone to same size under spring pressure on next part. Only adjustment necessary to duplicate size is for stone wear.

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Superior MD-1 Mandrel Driver

Rapid, economical hole finishing and sizing with .0001 accuracy. Ideal for die work, bushings, dowel pin holes.

Only the stones contact work piece, assuring long life and preventing marks on honed surfaces.

Permanent type mandrel sizes; .120 to 3.000; available in No. 2, 3 or 4 morse tapers.

SUPERIOR HONE CORPORATION

P.O. BOX 317

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the LONG... and short of it!



LONG ON SAVINGS!

Why use a 6, 8 or 10-foot shear to cut small pieces? The Lodge & Shipley 24" Speed Shear is big in everything but capacity and prices. It's a heavy duty, quality production type shear, less than \$3000 complete! It quickly repays its low cost in time and labor savings, doing jobs impractical (even impossible) on an oversize shear. Specially designed for the small jobs that tie up big shears, it has a capacity of $\frac{1}{4}$ " x 24" in mild steel.

The Speed Shear is designed not only for straight shearing with the use of a back gauge but for accurate duplication of straight-side parts without the expense of dies and punch press equipment. It provides fast, efficient cutting—proved in production by leading aircraft, electronic and other manufacturers and fabricators.

At standard speed, the Speed Shear makes 120 strokes per minute; using the non-repeat method, up to 60 strokes per minute. All adjustments are in front, including the back gauge, which can be adjusted to 1/126th of an inch. The work table is equipped for convenient notching and slitting.

If you're interested in shear savings, write Dept. SS-2, The Lodge & Shipley Company, 3074 Colerain Ave., Cincinnati 25, Ohio.

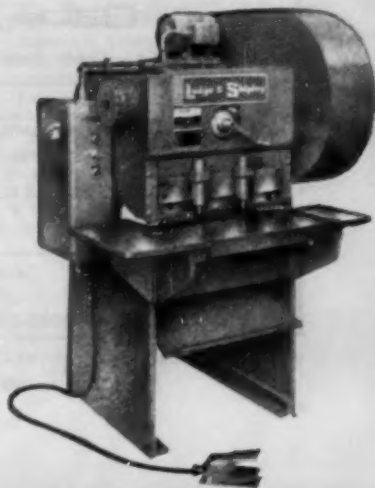
your Lodge-ical choice

Lodge & Shipley

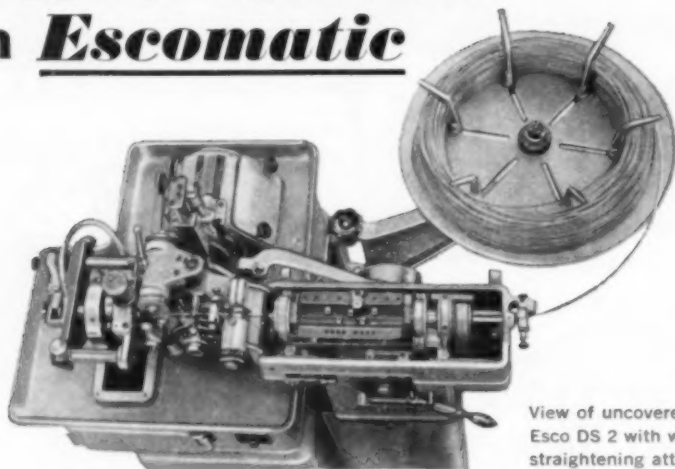
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SHORT ON FLOOR SPACE!

height overall.....	72"
width overall.....	50"
depth overall.....	50"
table height.....	36"
shipping weight...	2,600 lbs.



Produce Small Parts Faster At Lower Cost With An ***Escomatic***



View of uncovered
Esco DS 2 with wire
straightening attachment.

Feed from Coil or Bar Stock

TYPICAL PARTS MADE BY AN ESCOMATIC	
	12 parts/min. Commercial Bronze
	6 parts/min. Pinion Stock
	63 parts/min. Nickel-Silver

Up to 100 precision parts per minute are possible on the Esco DS 2, a Swiss form-turning and cut-off machine. Stock, fed from coils or bars of any length, is machined by two revolving cutting tools mounted in a cam controlled tool head. Resulting parts are clean, accurate and **entirely burr-free**—and are delivered separate from the chips. Coil feed provides efficiency up to 95%, eliminates bar ends, speeds production.

- Capacity Up to 5/32" dia. x 3 3/4" length
- Accuracy As close as $\pm 0.00025"$
- Finish As fine as 8 micro-inches

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**Production Time and Cost Reduced 80%
Product Quality Improved with
HARTFORD SPECIAL Air Hydraulic DRILL UNITS**



Model
19-150 Air
Hydraulic Unit

PART:
Hydraulic
Control Sleeve

MATERIAL:
S517 Steel

REQUIRED:
78 Accurately
Located Holes.
Drilled at
90° Angle.

The Char-Lynn Company, of Minneapolis, Minnesota, is a well-known manufacturer of hydraulic equipment for farm machinery. Rapidly increasing demands for the Char-Lynn Power Steering Unit made it necessary for this company to increase its production rates for components like the control sleeve shown here. To accomplish this, Char-Lynn switched from single spindle machines to two- and six-spindle machines assembled from Model 19-150 Air Hydraulic Drill Units and other standard components produced by The Hartford Special Machinery Company. As a result of this change-over, drilling time for the 78 holes required has been cut from 42-84 minutes to 9-10 minutes ... and per-piece costs have been cut from \$5.65 to \$1.80! Smooth operation with "no-surge" break-through has eliminated burring, so scraping is no longer necessary. Maintenance is only about one sixth of that previously required, and there have been no breakdowns that weren't "man-made." Write today for complete information, outlining your parts production requirements.

HARTFORD
Special

THE HARTFORD SPECIAL MACHINERY COMPANY
3200 COLLEGE HIGHWAY, SIMSBURY, CONNECTICUT

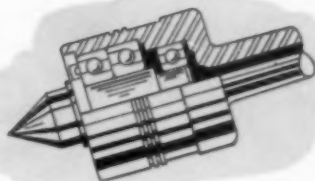
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You get day - in
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9. H TYPE LIVE CENTER, HEAVY DUTY

for lathes and turret lathes, meets requirements for heavier feeds and high speeds. Tandem flush ground bearings for greater capacity.



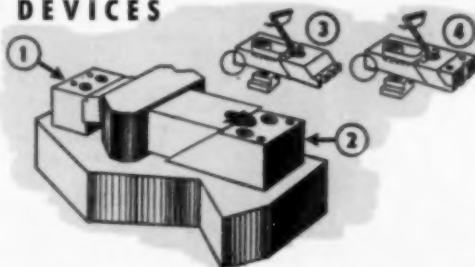
4. WHEEL DRESSERS

Hardened, ground & lapped. .0001" accuracy. Forms wheels to shape on surface grinders, tool and cutter grinders, cylindrical grinders.



6. DOWN-HOLDING DEVICES

secure workpieces quickly and rigidly, for all needs.



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day - out economy precision - crafted products

Complete Line of Precision-Built Live Centers

featuring one-year guarantees, self-adjusting bearing take-up, RPM speeds to meet capacity of modern machines, correct capacity ratings, hardened and ground throughout. Plus expansion compensators and divided thrust for maximum load.

J & S FLUIDMOTION Wheel Dressers

dress tangent in one continuous motion—two angles tangent to concave or convex radii—concave radius of 180° . Simple dressing of complex forms with .0001" accuracy for all types of surface and cylindrical grinders. Also new compound micrometer wheel guard adapts Model F in an inverted position on surface and visual grinders.

Down-Holding Devices for Any Requirement

famous for faster set-ups, stronger grip, less obstruction. Shown at left are: 1. Counter clamp, 2. Fixture clamp, 3. Standard Lo-Grip and 4. Standard Hi-Grip jaw clamps.

Literature and data on request

Specify product No. listed opposite illustration

J & S TOOL CO., INC.

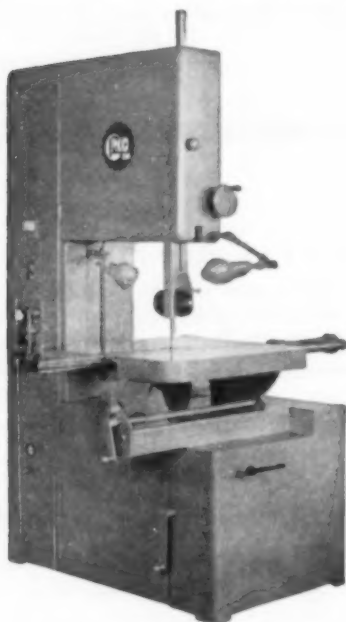
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- Speeds infinite from 35 - 12000 FPM covers both cold and hot sawing

- Variable drive 3-speed transmission with precision rolled gears and splines transmits 15 HP

- Hydraulic table feed

See the difference demonstrated in our dealers' showrooms

or

Write GROB INC. for complete specifications

GROB also manufactures a complete line of:



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FILING MACHINES
GEAR ROLLING MACHINES**

GRAFTON, WISCONSIN

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in new cost-reducing series
of DENISON "R-S-T"
hydraulic bench presses

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"R-S-T" SERIES MULTIPRESS

... versatile cost-reduction tool on small lots or high production runs. Standard accessories available to increase productive capacity.



FREE BULLETIN
... write for your copy of our 8-page specification and application Bulletin 324.

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PUMPS • MOTORS • CONTROLS

NEW PRESS series is designed to cut costs on your toughest production jobs. Here are the key advantages built into this new, ultra-efficient line of presses.

Produces more pieces-per-hour ... 65% faster approach. Faster return speeds on the hydraulic ram give you more cycles-per-minute.

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Faster to set-up ... new, quick, simple adjustment now sets position of ram in seconds. And you can "inch" the ram to the work under set pressure. Closer control of ram pressure is quickly attained with a newly-developed relief valve.

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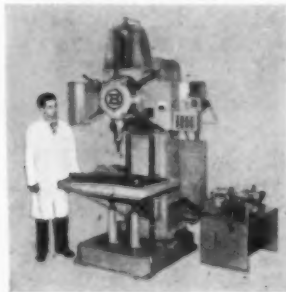
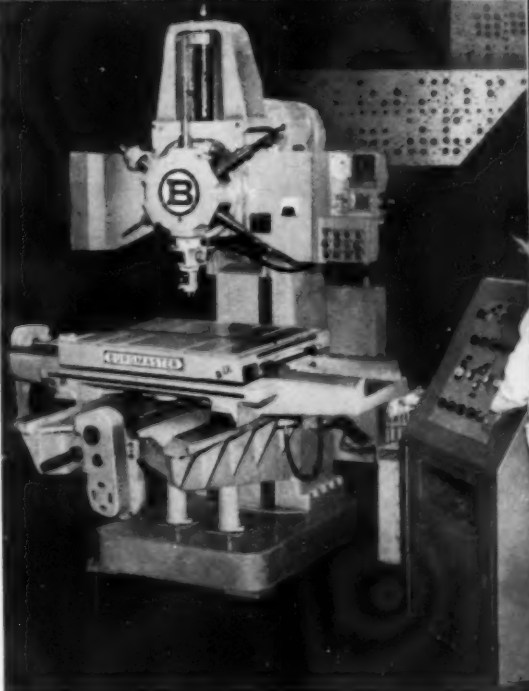
New!

BURGMASER

The new Burgmaster Model 25AHT is a heavy duty tape controlled machine that introduces improved controls and many mechanical refinements. An optional 4-speed motor doubles the spindle speed range; numerical controls of the most advanced design automatically machine complex hole patterns with precision, eliminating complicated fixtures, jigs or drill bushings.

CHECK THESE IMPORTANT MACHINE FEATURES

1. Preselective individual spindle speeds.
2. Speed range: 90-3000 RPM (24 speeds)
3. Preselective infinitely variable hydraulic feeds.
— Range 1/4"-50"/Min. Rapid Traverse up and down at 240"/Min.
4. Hydraulic feeds are automatically temperature and pressure compensated.
5. Positive hydraulic feed rates are dial calibrated.
6. Table automatically positions on 2 axis; turret simultaneously indexes through predetermined sequence.
7. Selective rapid approach and return and preset Depth Stops—quick-setting type. ("Z" axis control optional, at extra cost.
8. Heavy-duty construction — weighs up to 10,000 lbs.
9. Quick set-up from one job to another: 25 to 30 minutes.
10. Index accuracy — Spindle to Spindle .0004".
11. Very rigid spindle and turret suspension with turret clamp for programmed milling.

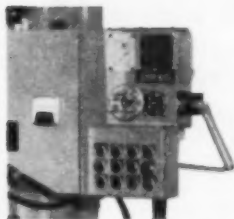


BURGMASER Model 25AH Automatic Hydraulic 6-Spindle Turret Drilling, Tapping and Boring Machine is also available in this new series and has the same basic machine features and improvements as the model 25AHT Tape Controlled Machine.

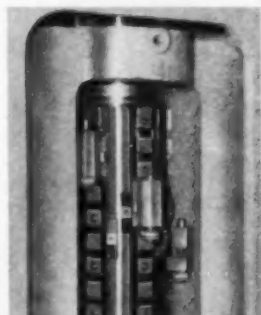
HOW BURGMASER FEATURES SOLVE TOOLING, PRODUCTION AND INSPECTION PROBLEMS:

- Greatly reduced lead time to get into production—ideal for small lots.
- Simplified tooling—eliminates expensive fixtures—drill bushings not required.
- Easy to program: 1 minute per hole location; prepare tape: 4 holes per minute; set up machine: 3-5 minutes per tool.
- Lower labor costs—requires only semi-skilled labor.
- Less spoilage—does not depend upon operator's skill.
- Greater accuracy of hole location. Table positions automatically $\pm .001$ ", repeatable to $\pm .0003$ ".
- Increased tool life—feeds and speeds are preselected for greater efficiency.
- Reduces inspection—center dimensions automatically controlled.
- Easy to operate—one operator can run two or more machines, inspect, deburr, etc.
- Will replace 6 spindle, in-line drills, radial drills, jig borers for many applications, multiple drill and tap heads, expensive fixtures, layout drills, etc.
- Most important—will return its investment more quickly than almost any other standard type machine.

6-SPINDLE TURRET DRILL AUTOMATIC HYDRAULIC 1 1/4" CAPACITY TAPE CONTROLLED 1/4" IN STEEL



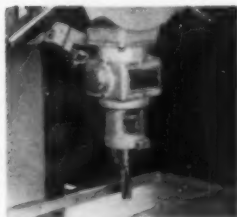
Quick Setting Controls are used to preselect infinitely variable feeds, pressure and temperature compensated, from 1/4" to 50" per min., with direct reading dial. Pre-select spindle speeds ranging from 90 to 3000 RPM.



Quick-Set Depth Stops and quick set traverse controls are hand set for rapid set up. Final adjustment with a micrometer screw permits high accuracy.



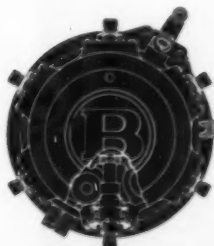
One-Piece Forged Spindle and Gear provides increased spindle strength and minimum spindle run-out. Preloaded high precision double row ball bearing at rear give maximum rigidity.



Lead Screw Tapping Head greatly improves the finish and accuracy of tapped threads and eliminates scrap due to pulled or loose threads. Capacity 1"-8" in steel.



Positioning Table is mounted on a double dovetail column way and supported on double synchronized screw jacks that position table for height. Positioning accuracy in X and Y axes is $\pm .001"$ over the table travel, and repeat-ability to $\pm .0003"$.



The Turret is rigidly held against the face of the slide on a wear plate and securely clamped in a "V" type cam lock clamping ring to provide increased accuracy during heavy machining operations.

Write for new Burgmaster Model 25AHT and 25AH 6-Spindle Turret Drilling, Tapping and Boring Machines. Forty-minute 16mm sound film showing all Burgmaster Turret Drills in operation is available without charge.

Bulletin describing



World's Largest
Builder of Turret
Drilling Machines



"O" Manual Power
Index 1/4" Capacity



1C Manual Power
Index 1/4" Capacity



2B Manual Power
Index 1/4" Capacity



2BR Ram Type Radial
Drill 1/4" Capacity



2BH Automatic Hydraulic
1/4" Capacity



3BH Automatic Hydraulic
1 1/4" Capacity



25AH Automatic Tape
Controlled 1/4" Capacity



2BHT 3BHT Automatic
Tape Controlled
1/4" and 1 1/4" Capacity



3 BHT Automatic Tape
Controlled 1 1/4" CAP.



3 BHT Automatic Tape
Controlled 1 1/4" CAP.

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CUT ACCUMULATED ERRORS to a minimum with the DIXI 75

horizontal optical jig borer

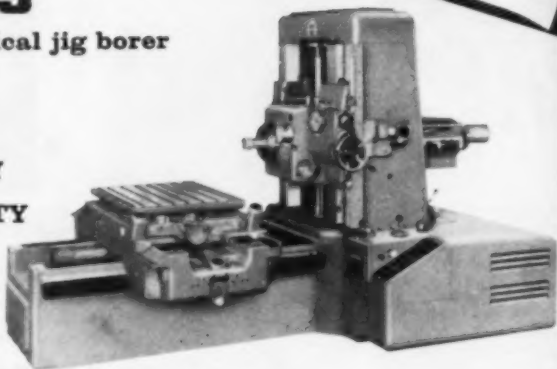
increased

ACCURACY

VERSATILITY

PRODUCTIVITY

Made in Switzerland
Measurement in inches



- Automatic positioning can be changed instantly to manual operation
- Projected optical setting—direct reading to .00005" for linear motions and 1 sec. of arc for built-in rotary table. Linear optics provided with adjustable zero reference
- Simplified controls functionally arranged for greater operating speed and efficiency
- 3" diameter boring spindle
- Increased capacity: table size 39 $\frac{3}{8}$ " x 32"; 29 $\frac{5}{8}$ " cross travel; 23 $\frac{5}{8}$ " longitudinal travel; 25 $\frac{5}{8}$ " vertical travel
- Hydraulic feeds and infinitely variable spindle speeds
- Rear support optional

MBI has engineers available for consultation, guarantees service by factory trained staff, and stocks spare parts in New York.

**Demonstrations upon request at our conveniently
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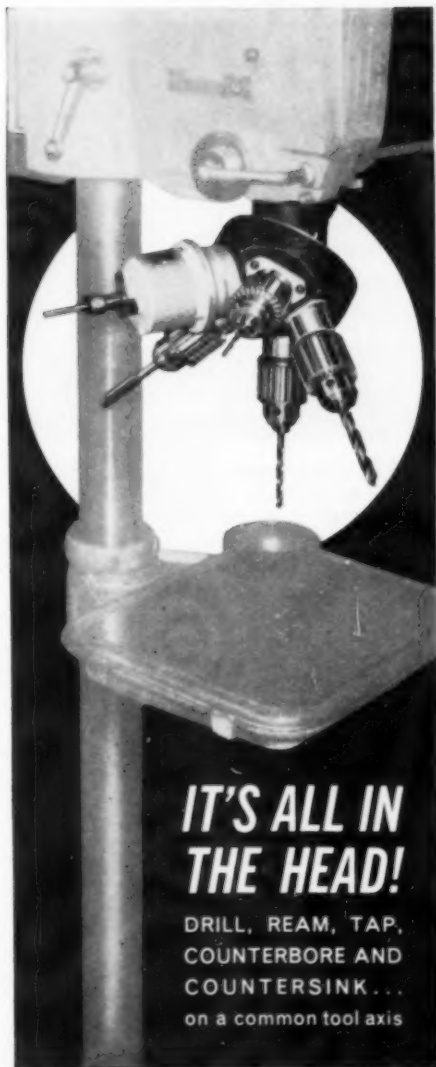
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**IT'S ALL IN
THE HEAD!**

DRILL, REAM, TAP,
COUNTERBORE AND
COUNTERSINK...
on a common tool axis

5 Spindle Model Shown

**... CONVERT YOUR DRILL
PRESSES INTO PRECISION
TURRET DRILLING
MACHINES WITH ...**

QUADRILL 4 & 5 SPINDLE **TURRET DRILLING HEADS**

- Save up to 70% in direct labor costs!
- Fast manual indexing
- Quadrill Turret Heads make it possible for **one** drill press to do the work of 4 or 5 single spindle drills, with a corresponding saving in floor space . . . save up to 350% in capital equipment costs!
- Ideal for both long and short runs . . . fast setups . . . simple tooling. On long runs, savings in direct labor quickly returns cost of turret head.
- Models available for all standard drill presses.

Quadrill Turret Drilling Heads are proven in industry throughout the world for over 15 years . . . in companies such as Westinghouse, Chrysler, Bendix, General Electric, Douglas Aviation, Boeing and many others.

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875 DOLLARS

Buys this CLAUSING Vertical Miller

And look what you get!



1. ACCURACY VERIFIED to within TENTHS—

- Spindle taper (internal) runout within .0002" at spindle nose.
- Spindle square with table, front to rear, within .001" TIR in 5" circle.
- Top of table square with column ways within .0005" in 6" travel.
- Table T-slots parallel to table dovetail ways within .0005" in 8" longitudinal travel.

These and other tests showing exact indicator readings are on the report accompanying your machine.

- 2. VERSATILITY**—The Clausing mills, drills, bores, reams, and shapes . . . at all angles . . . with one work set-up! It's perfect for general production, experimental, layout, and light jig-bore work.

- 3. EFFICIENCY**—Users report that "*the Clausing is the easiest to set up, get around and operate of any mill . . . and it has sensitivity you don't get in larger machines—a mighty important factor when using small cutters.*"

Make any comparison you want . . . We're sure you'll agree the CLAUSING vertical mill is truly an outstanding machine tool value! Write for a catalog today.

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WAPAK ENGINEERING SERVICE

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This "Metal Cutting Manual" is the most complete book of its kind ever published. Write for free copy.

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The **LARGEST** Standard Line of
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Standard Tools to fit ALL applications—from 1/8" to 18" holes!



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Buy **ONE** Maxwell recess tool holder—do many jobs—take wider cuts; use circular form, bit-type, carbide or other bits to meet your cutting needs; use on any machine due to interchangeable piloted-type shanks.

Only **MAXWELL** gives you greater cutter strength and concentricity because Maxwell pilots directly on the work with less overhang.

A-3181A



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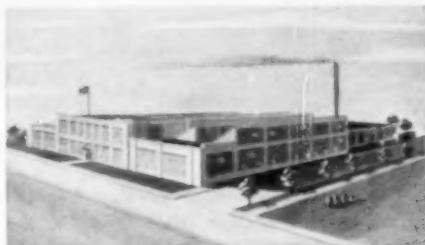
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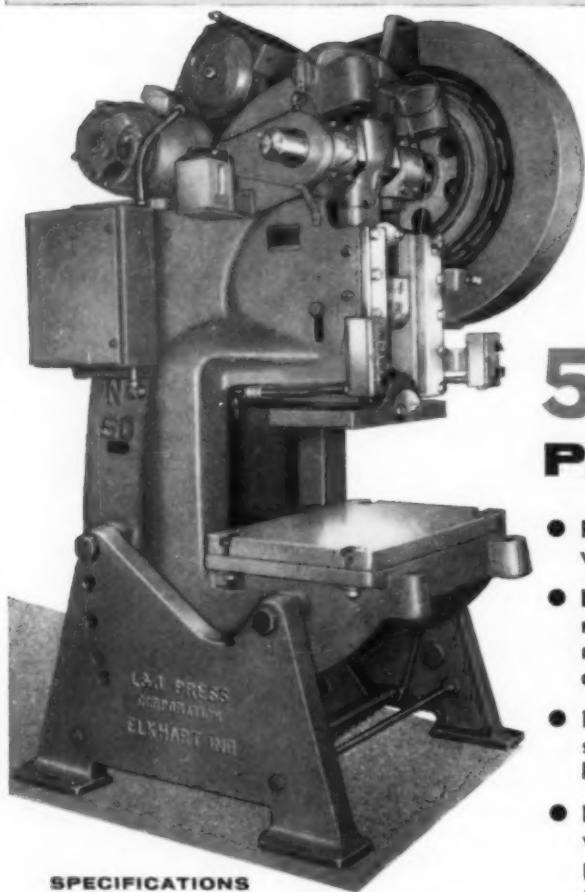
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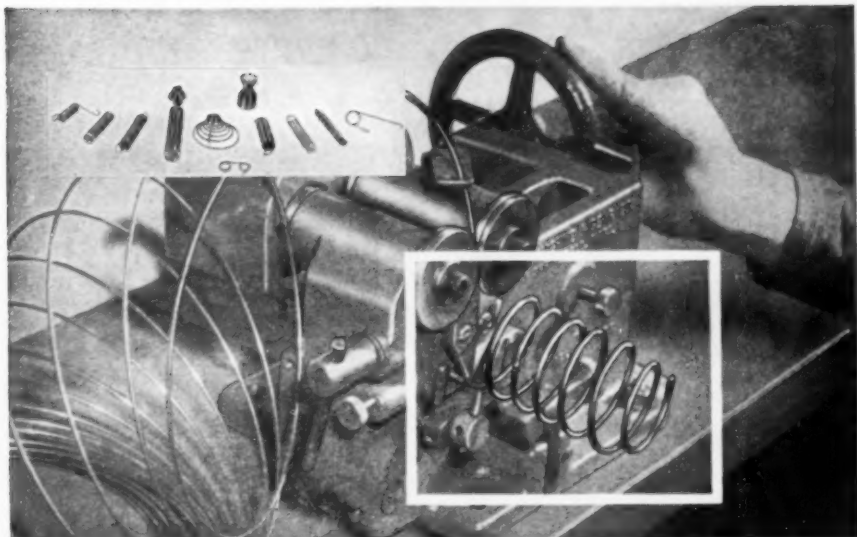
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Two capacities—50 or 60 tons, geared and non-geared models. Slide face 24" x 12". Bolster 36" x 24". Opening through back 22". Shut height 11'". Slide stroke 4'". Slide adjustment 3". *or to suit

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Starrett adjustable jaw cut nippers (left) and Gardener Hook-Kon spring looping tool (center) — handy, precision, time-saving accessories for spring coiling. Perkins Spring Coiler available as bench model or power model shown here, (right) for tool shop or continuous runs.

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Precision Ground **ATrax** SOLID CARBIDE TOOLS AND BURS

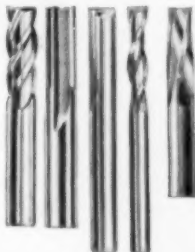
Job Applications

THERE IS AN ATRAX SOLID CARBIDE END MILL ENGINEERED FOR SUPERIOR CUTTING PERFORMANCE ON ANY MATERIAL!

The most widely used Atrax End Mills and the materials on which they are engineered to perform best are shown in this table:

RECOMMENDED APPLICATIONS

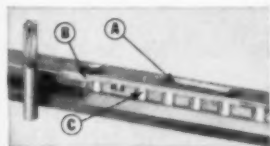
**ATrax
"STANDARD"
SOLID
CARBIDE
END MILLS**



Material	Series 1501	Series 1502	Series 1503	Series 1504	Series 1505
Carbon Steels					X
Free Cutting Steels					X
Nickel					X
Nickel Chrome					X
Stainless Steels					X
Cast Iron		X	X		
Malleable Iron		X	X		X
Brass and Bronze	X				
Aluminum	X			X	
Zinc Alloy	X				
Copper	X				
Hard Rubber	X				
Fibre	X				
Plastics	X				
Monel Metal					X
Toughened & Heat Treated Steel					X
Hardened Steels					X
Titanium					X
Magnesium	X			X	

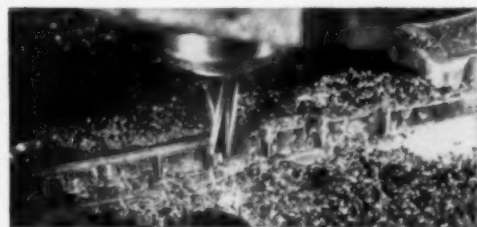
X—Preferences

TYPICAL SERIES 1505 PERFORMANCE ON ROCKWELL C-64 HARDENED TOOL STEEL WORKPIECE



- A** Elongating 3/8" slot, 1/16" deep at 700 rpm.
- B** Step cutting 3/16" wide—3/32" deep at 1150 rpm.
- C** Counter boring at 1150 rpm.

Note high surface finish and absence of burs and scoring. This Atrax 3/8" 1505 End Mill showed no appreciable wear land after completing three operations on this hard-to-cut material.



Note efficient, uniform chips with no burning and no chatter.

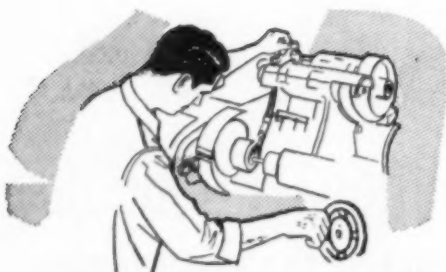
AN END MILL FOR EVERY APPLICATION

There is an Atrax "Standard" Solid Carbide End Mill job engineered for virtually every End Milling application. The Atrax Catalog gives engineering data on speeds, feeds, use of coolants and job hints that will further increase tool life and speed production when you specify and use these superior Atrax Tools.

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of the 148 page Atrax Catalog



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In large .0001" graduations, the pointer provides a **FIXED** (not passing) size reading.

Uniform accuracy automatically assured

Unique self-aligning, self-centering and uniform gaging pressure guarantee duplication of results free of user influence.

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Reveals front or back tapers, ovality, barrel shape, bell mouth, showing actual amount of deviation.



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Airplane Co.
Felt Corporation
Ford Motor Co.
General Electric Co.
Hamilton Standard
Division
Harris Seybold Co.
Hawthorne Corp.
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Leas, Inc.
McDonnell Aircraft
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BULLETIN 50 ➔

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with interchangeable expansion plugs to gage
simple or special holes to a fraction of .0001".



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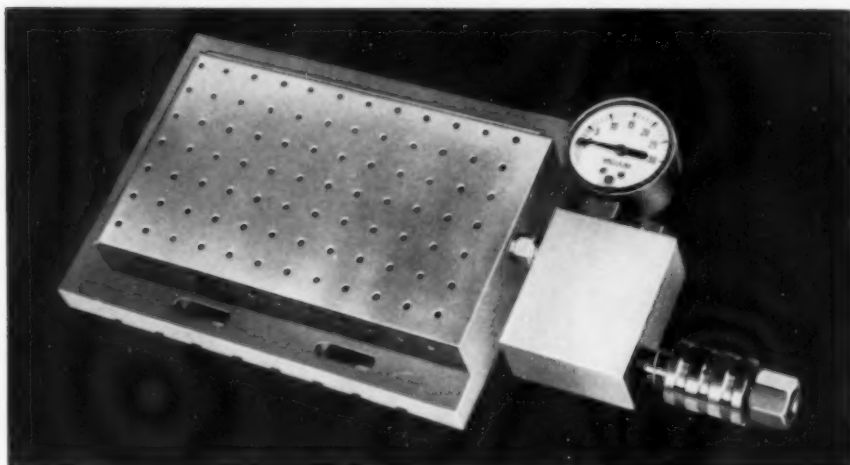
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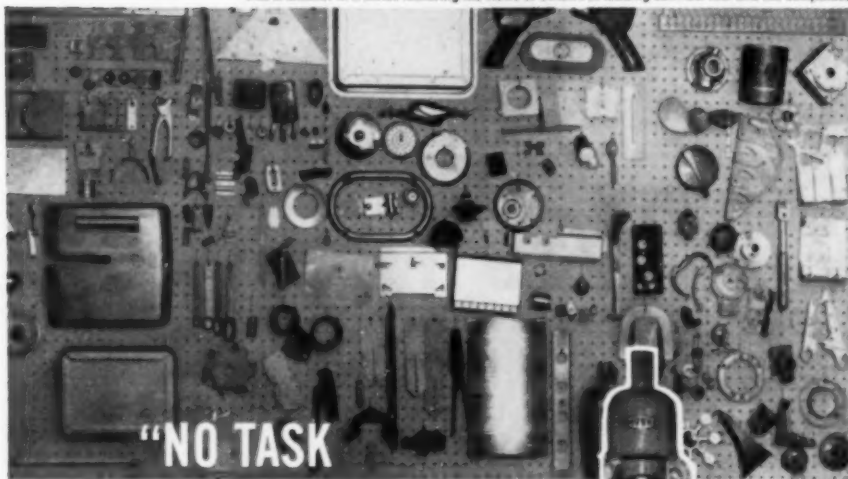
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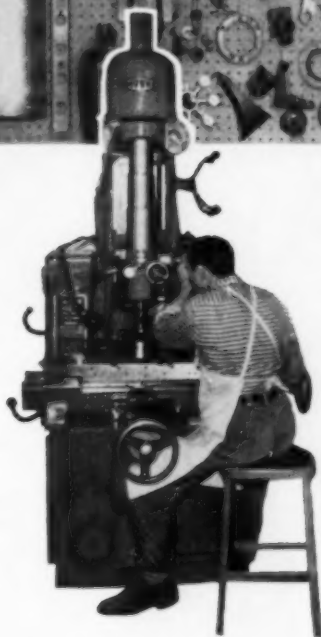
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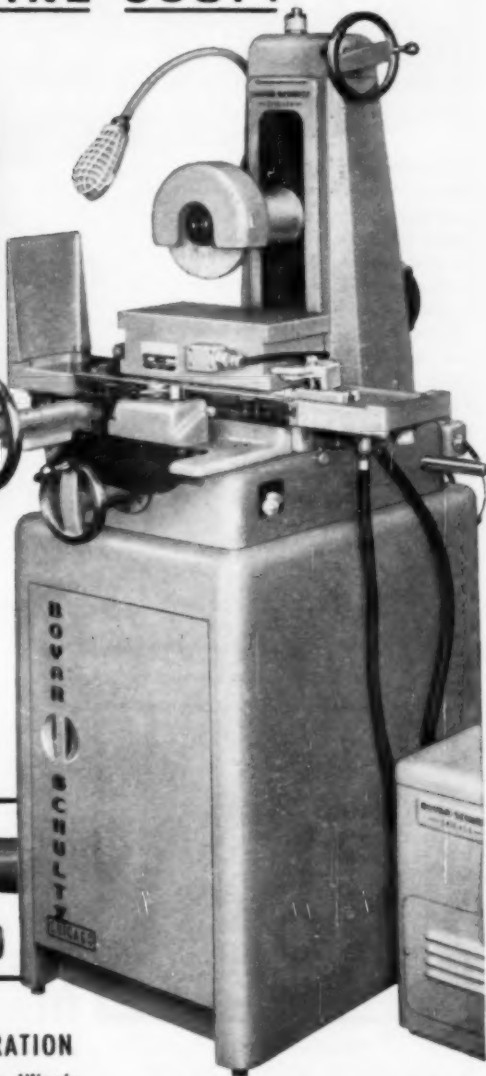
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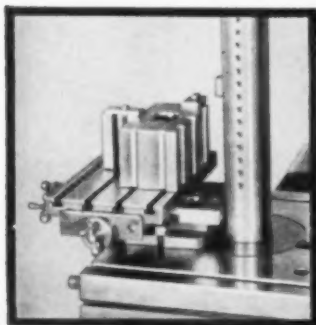
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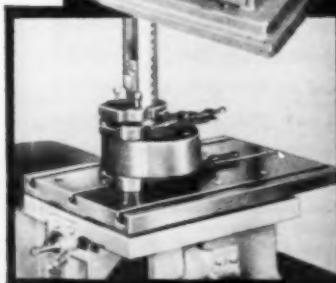
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Right: Set-up for internal cutting
Below: Set-up for external cutting



106



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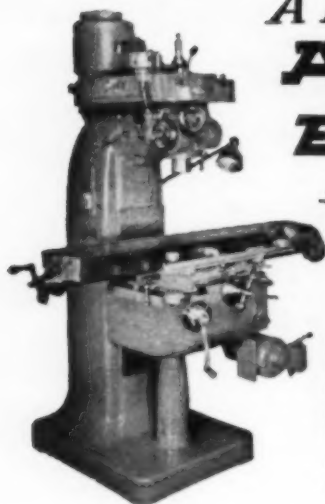
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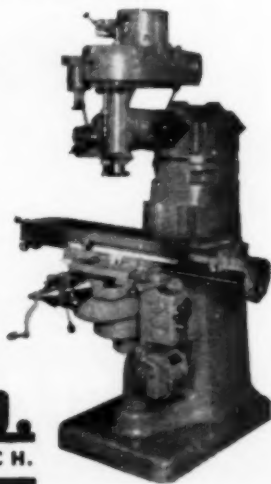


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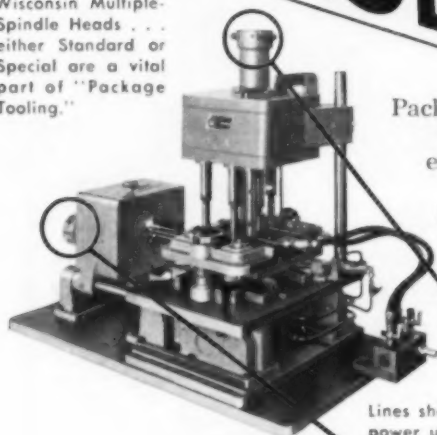
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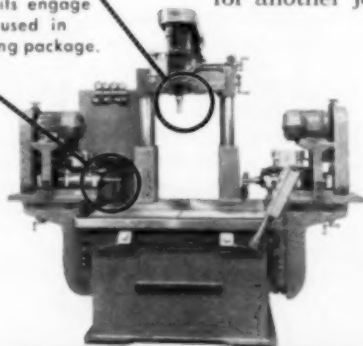
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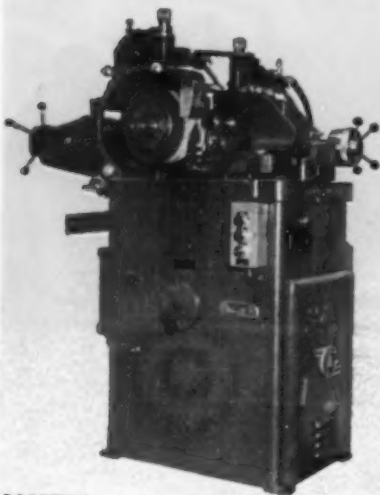
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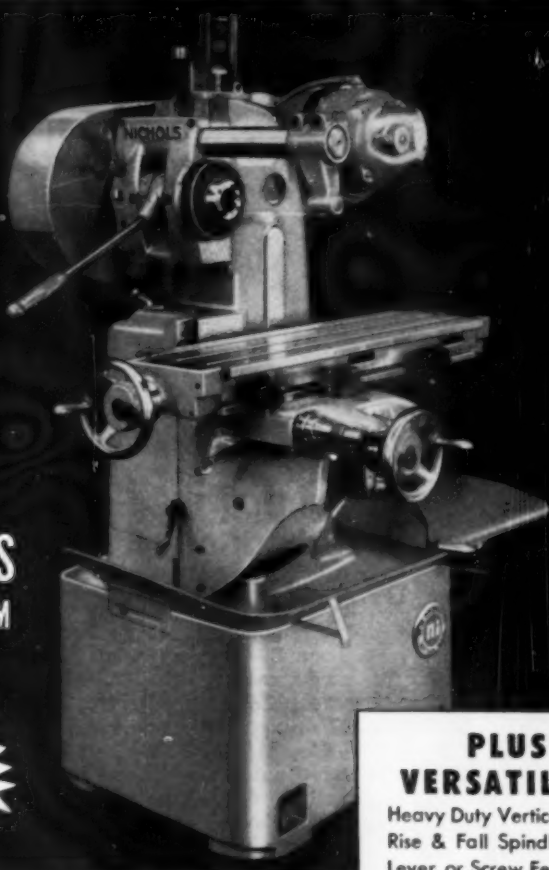
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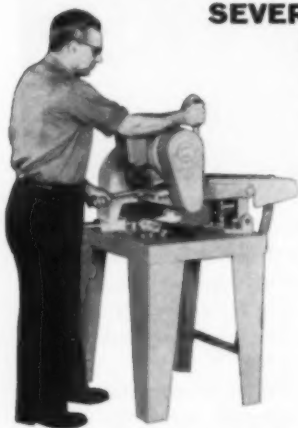
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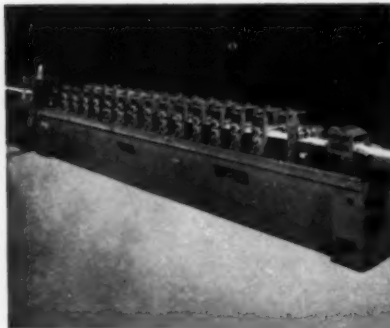
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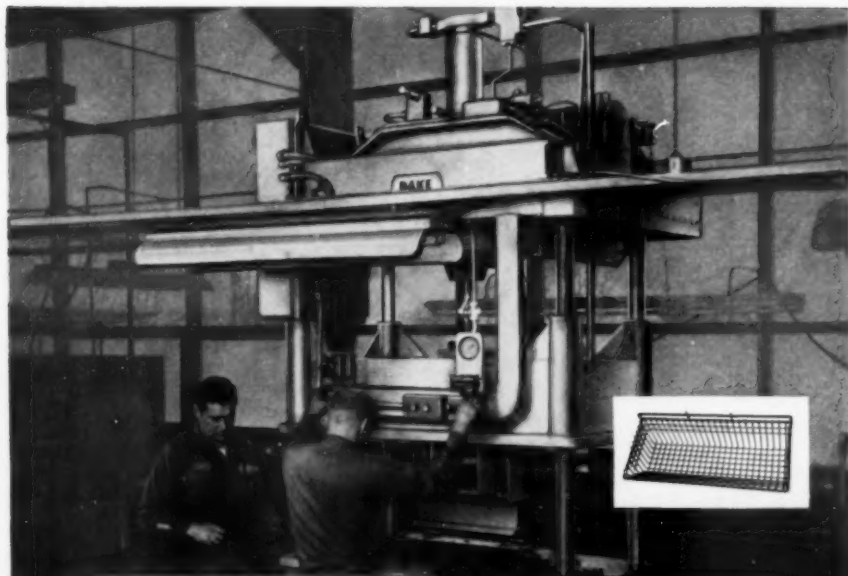
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MACHINE and TOOL BLUE BOOK

features in this issue

WHAT HAPPENED AFTER OUR SEARCH FOR FURTHER COST SAVINGS . . . LED US INTO NUMERICAL PROGRAM CONTROL is explained by Dr. W. W. Gilbert is an interview with Managing Editor Jim Pond. Three vital subjects are discussed: planning for programmed machine tools, industry's conflicting views toward education, and why there is trouble ahead in the area of machinability **Page 122**

WITH SO MANY VARIABLES AT WORK . . . WHICH MACHINE SHOULD YOU SELECT? A new columnist, James H. Meehan, draws an analysis tree to illustrate the importance of knowing the primary and secondary functions of machine tools. By knowing a machine's functions, better utilization of equipment can be obtained **Page 99**

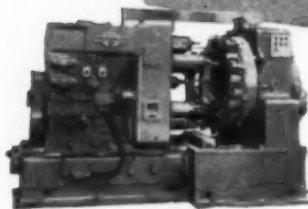
WOOD CONSTRUCTION FOR JIGS AND FIXTURES . . . WHY NOT? asks Harold Sedlik, a tool engineer. Many applications in which wood might excel are discussed in this article. The author also reviews the characteristics of wood, including tips on how to overcome some of wood's shortcomings with respect to its use on metalworking machine tools **Page 132**

ABRASIVE BELT GRINDER TO DISPLACE HAND GRINDING on many jobs where a new rise and fall feature of a machine can be applied. C. E. Wesson, President of Eastern Screw Corp., describes several successful applications found at their plant. **Page 140**

IS IMPROPER PRODUCT DESIGN SHORTENING YOUR DRILL LIFE? asks Harry Conn in his regular column **ENGINEERING and TOOLING**. This well illustrated article gives the reader some ideas on how to increase drill life and how to reduce drill breakage **Page 109**

SHOULD YOU OR SHOULDN'T YOU USE NUMERICAL CONTROL? Here's a quick check list which may guide your thinking. The list was prepared by William C. Moog, president of Moog Servocontrols, Inc., and a designer of control systems. If you are thinking of numerical control for your machine tools, don't miss this! **Page 145**

... an example of Automatic Production by Greenlee ...



97 cast iron oil pump bodies an hour

This Greenlee 12-station, horizontal indexing machine rough and finish machines cast iron oil-pump bodies for a leading auto producer at the rate of 97 pieces per hour. Indexing is fully automatic. Cycle time is 37.2 seconds. Tolerances of $\pm .001$ " for boring depth and $\pm .0005$ " for ream hole size are maintained.

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STATION 2 — drill

STATION 3 — drill

STATION 4 — drill, chamfer

STATION 5 — rough bore

STATION 6 — rough ream

STATION 7 — rough bore

STATION 8 — semi-finish bore

STATION 9 — semi-finish bore

STATION 10 — finish ream, finish bore

STATION 11 — finish ream

STATION 12 — finish ream, finish bore

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By **Bill Schleicher**
Vice President and Editorial Director
Hitchcock Publishing Company

- ✓ *Hats off to the machine tool industry*
- ✓ *Answer to competition*
- ✓ *Many problems left unsolved*
- ✓ *New processes*

■ The American machine tool industry deserves much more than a pat on the back for its recent, successful, exposition. At Chicago they displayed more than machine tools; here were America's muscle and might, the tools which made this land strong. These are the tools which serve notice to the communist bloc, who have vowed, to "bury the United States under an avalanche of industrial goods," that the matter of burying may be permanently delayed.

While competition with the communists is much more serious, involving, as it does, our very liberties and lives, we must also be aware of the competition from other foreign sources, even though politically they may be friendly to us. As long as our welfare and our way of life is deeply rooted in economic health the threat posed by all foreign competition is serious and worthy of attention. There are no friendly competitors. We can, however, draw this distinction: while communist competition threatens our life, other competition threatens only our economic life. Neither threat must be ignored. The

machine tool industry showed American industry one answer at Chicago.

While it is easy to exhort industry to modernize it must not be overlooked that the government must also be a contributing force to this program. Our depreciation and tax laws, which do not take into consideration inflationary forces of the last 20 years, are as antiquated as the pony express. Some government officials hold onto these archaic concepts with all the tenacity and willfulness of a baby whose rattle is being threatened. At a time when foreign governments are busily helping their home industries capture foreign markets and assists them tax-wise and by every other legal means, our own government spins webs of restrictions which, far from helping, act as deterrents to industrial growth.

The absolute irresponsibility of some labor leaders in calling strikes at a time when everyone should buckle down to increasing output to insure a healthy economy is more than reprehensible, it is traitorous to the laboring class. We sometimes wonder if the greatest danger to the working man does not lie in his own labor leaders rather than in business which through its practices during the first thirty years of this century brought about the rise of unionism.

While modernization is hampered by governmental restrictions and frequently not fully supported by unions we cannot ignore the responsibility of business management in refusing to replace equipment. The engineering and production executives of American industry are certainly aware of the need and can appreciate the

tools which are available for their more efficient use; this can, unfortunately, not be said of many a business manager whose horizon is obscured by a row of dollar signs. The old gag of, "you're making chips, what more do you want?" is not an idle one. Too often an executive, oriented to profit and loss statements, may be unaware of the effects outmoded machine tools have on his P and L statements. A new or improved process may mean the difference between keeping a market and losing it.

Speaking of new processes brings to mind—and you'll be hearing much of this as time goes on—of conversations I had with Messrs. Dolle and Verson. The former is of Lodge and Shipley, the latter, of course, with Verson Allsteel. Both companies are vitally interested in chipless machining. Mr. Dolle told us that, "the applications for this method of producing parts are only coming to the front now. The possibilities for economical production are fantastic. The method promises a high return on the investment."

At Verson we saw the pressing of sun gears to such fine dimensions that only minor cleanup machining is necessary to finish the part. "This is a new concept in production," explained Mr. Verson. "Industry must learn to think in terms of processes. This is in contrast to the accepted thought of 'what machine shall we put it on?'. There are too many new processes which can produce parts more economically and with greater speed for engineers and production executives to be blinded to them."

• • •

By **James H. Meehan***
Machine Tool Consultant

2

MACHINE TOOLS



With so many variables at work . . .

Which Machine Should You Select?

■ A shop foreman frequently is confronted with the task of deciding which machine he should assign to a certain job, and he finds himself with quite a choice. If it is a lathe job he can do it on an engine lathe, a turret lathe, a hand screw machine, or an automatic screw machine. The choice would depend on the types of machines available, the quantity of parts in the lot, and the operations to be performed.

If it were a cylindrical grinding operation, it could be done on a Plain, Universal, Universal & Tool, or a Cutter & Tool Grinding Machine. The choice again would depend on the number of parts in the lot, and the types of machines and attachments available.

The selection of the right machine of those available to do the job in the most economical manner is the basis of our subject, and to help visualize this common problem an "Analysis Tree" has been developed. It is based on the premise that if we determine the purpose for which a machine is designed, we can determine the purpose for which it should be applied. An awareness of this

*James H. Meehan was formerly Director of Milling and Grinding Machine Sales, Brown & Sharpe Manufacturing Company.

***If you know the purpose of a machine's design
you know the area where it should be applied***

principle is equally valuable to the buyer, seller, and user of standard types of machine tools.

An Analysis Tree can be constructed for any group of machines having a common denominator of application. We shall for this purpose consider a group of grinding machines, which are so frequently misapplied, consisting of: Plain, Universal, Universal & Tool, and the Cutter and Tool types.

The common denominator will be a part as shown, the operation being to grind 1" diameter. The check mark (✓) indicates a basic function or application of the machine, and an asterisk (*) indicates a secondary function, or an operation which can be performed with an attachment with a lesser degree of efficiency.

In explaining the Analysis Tree shown, we of course start with the operation to be performed, which is to grind the 1" diameter 6" long. We then show below the base line the types of machines capable of performing this grinding operation, the more limited machines placed on the outside for convenience.

The "Tree" advances above the base line to the point where the first machine, the Plain Grinding Machine, reaches its limitation of being able to grind only external cylindrical surfaces, straight or moderate tapers. Hence a single primary is the sole intended function of the Plain Grinding Machine.

The "Tree" continues until the Cutter and Tool Grinding Machine branch shows a single primary, which is sharpening cutters and tools, for which the machine is named and for which application it is most efficient. For those not having sufficient cutter & tool sharpening to keep the machine busy a reasonable part of the time, the designer provided for other grinding operations either through attachments or flexibility, as secondaries, such as external and internal cylindrical face, and surface grinding operations.

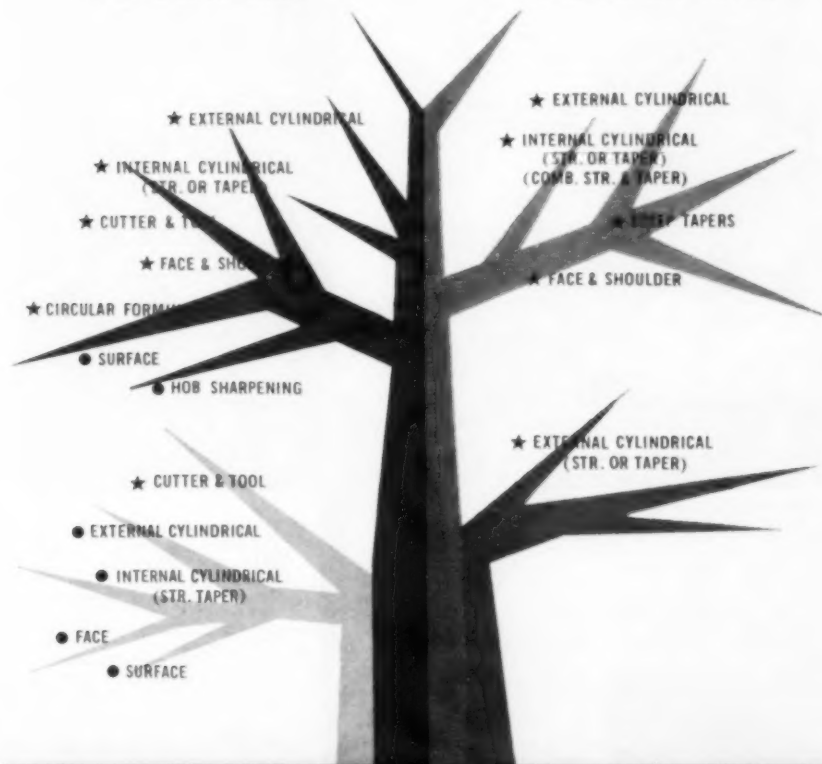
The Universal Grinding Machine is the next branch on the "Tree" with four primary functions designed into it—external and internal cylindrical grinding, by virtue of the live and dead center headstock for internal and external grinding respectively, and the internal grinding attachment which is usually an integral part of the machine.

The compound wheelslide also permits grinding of steep tapers with the periphery of the grinding wheel by using the crossfeed handwheel to traverse the wheel across the surface of the work on the angle to which the wheelslide is set, with the sliding table stationary. This function can be combined with the traversing and swivel tables for grinding the normal range of tapers, to grind both a steep and normal taper at a single setting. By swiveling the headstock spindle at 90° to the sliding table an excellent job of face grind-

JOB ANALYSIS - MACHINE SELECTION

★ PRIMARY FUNCTION

● SECONDARY FUNCTION

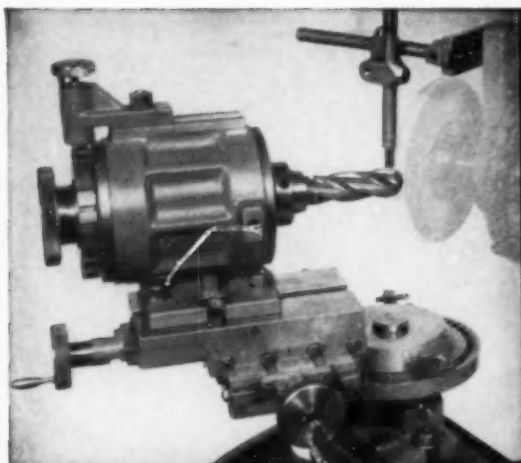


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PLAIN

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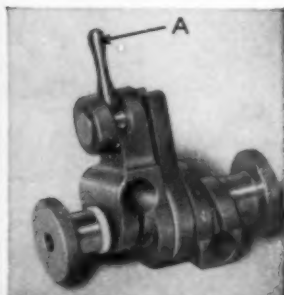


UNIT 4A, Radial Grinding Fixture for sharpening fluted end mills with square, conical, or ball-nose mills. The index disc provides for multi-flute cutters.



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Primary and secondary functions can be determined from the design of any tool

ing can be done on the Universal Grinder using power crossfeed and table traverse.

The remaining branch on the "Tree" is the Universal & Tool Grinding Machine which the designer intended to be used for external and internal cylindrical grinding, cutter and tool sharpening, face and shoulder grinding, and circular form tool grinding with equal efficiency, and surface grinding and hob sharpening as secondary functions.

It is obvious from the foregoing that the greater the limitations of a machine, and the greater the efficiency for its intended purpose, flexibility is obtained at the sacrifice of rigidity. A machine designed to provide both flexibility and rigidity would be a monstrosity.

A common error in toolrooms and jobbing shops is too many machines of the universal type. So frequently we see several universal milling machines in a toolroom without there having been an occasion to mill a spiral for years with the attendant loss of cutting efficiency over the plain milling machines. On other occasions we have seen several horizontal type milling machines in use, each employing a vertical milling attachment. Possibly one vertical milling machine could replace most of the vertical attachments, and the horizontal spindle machines would then be available to do the work for

which their designer primarily intended them.

A brief study of the Analysis Tree will reveal that regardless of the number of parts in the lot, if the operation is one of grinding an external cylindrical surface on centers, the Plain Grinding Machine is the machine to use for the most economical results. On the other hand the Universal & Tool Grinding Machine with its extreme flexibility is available to do the unusual job which may arise, as well as take some of the overload from the Plain, Internal, Tool & Cutter, or Surface Grinding Machines.

Primary and secondary functions can be determined from the design of any standard machine tool. When this has been done, the machine should be employed for its primary purpose for best economical results. Similarly we should be aware that standard attachments broaden the scope of application of a machine, and are not for continuous use with the basic machine merely to provide power to drive it. This rule of course does not apply to the automatic screw machine for which its attachments are designed for continuous service as may be required to complete the part.

An understanding of design analysis, as illustrated by the Analysis Tree, by buyers, sellers and users will result in more efficient machine tool application.

• • •

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PROCESS ENGINEERING

When designing jigs and fixtures . . .

Don't Overlook The Possibilities Of Built-In Quality Control

By **Clifford A. Code** Tool and Methods Engineer
Nordic Engineering Inc. Franklin Park, Illinois

■ When we built quality control into our jigs and fixtures on a particularly difficult job, lower manufacturing costs, improved quality of product and a reduced price to the customer resulted in numerous repeat orders.

The component part our company was producing went into a sub-assembly. Thirty-seven progressive operations were involved to complete the part. When production first started, the customer required 500 parts per day and one inspector was quite able to run periodical inspections on the operations. Demand increased and the customer asked if we could step up our production to 2500 per day.

A 500% increase in production required a more rigid quality control program. We were faced with the problem of obtaining optimum inspection control.

Weighing the problem carefully, we decided to build our inspections into the jigs and fixtures. Each operation was analyzed in order to permit a gage to be built into the fixture to check the preceding operation. Sometimes it was impossible to check at the next operation, so we

An example in which a manufacturer was able to incorporate automatic gaging into his fixtures

tried to place a gage into another fixture farther down the line.

For example, the part was round calling for a hole to be drilled and reamed on a milled flat with a plus or minus .002" in location. The first operation was to mill the flat. In the second operation fixture we had a bar that was .001" under the high limit of the milled flat. Note, we did not take full advantage of tolerances. In order for the part to be received by the second fixture it could not be any higher than .001" oversize.

The hole was then drilled as operation two. Operation three was a similar fixture where the hole was reamed to a hole tolerance of plus or minus .001". Operation four, the next fixture in line, had a location plug .0005" above the minimum dimension. Notice again, we cut our tolerance in half, thus assuring us that should our reamer be cutting more than .0005" undersize, it would not fit on the locating pin. We also had a nest .003" over our outer diameter size, thus holding our centerline to tolerance of plus or minus .0015". We controlled our oversize hole by another fixture farther down the line.

This method was repeated throughout the line to the extent that if a part passed through the line successfully it met all inspection requirements. The reason why we never took full advantage of tolerances was to

allow for any wear that might develop.

It stands to reason that you cannot build all inspections into your line. Where we originally had 37 operations requiring fifteen major checks and ten minor checks we now have three major checks and only two minor checks.

Due to closer quality control our parts were processed at a greater rate of speed through the line. *We were still able to maintain our quality control with only one inspector.* At any time it was possible to check the whole production line by taking 10 pieces and sending them directly through the line. Normal process of the line is for each operation to place its parts into live storage banks between operations. This flow of ten pieces could be accomplished in less than 30 minutes, with a complete assurance as to the quality of the parts in the live storage banks. If any operation rejected a part the trouble was found immediately by knowing what gauge was built into the fixture.

With this program in effect we found we received our increase in production with only a 300% increase in our tooling and work force. We were able to amortize the cost, give our customer a price cut and decrease our scrap allowance. Our customer was well pleased with our quality and gave us numerous repeat orders.

• • •

By **Harry Conn**
Chief Engineer
Scully-Jones & Co.
Chicago, Illinois

ENGINEERING and TOOLING



Is Improper Product Design Shortening Your Drill Life?

■ The first consideration for improving the number of holes a drill can drill per grind should be the design of the part. Now, what effect will the design have on tool life? The manufacturing engineer can often get the product design department to make changes in design if he can prove that a substantial saving in drill life will result and functional performance not be hindered. The various holes and conditions shown in Figures 1, 2, and 3 are some of the common conditions under which twist drills are expected to operate with consistent results.

Any engineer who has given drilling much thought can see from holes 4 and 6 in Figure 1, that if they were allowed to drill surfaces such as shown for holes 5 and 7 the improvement would amount to several hundred percent. Hole number 5 shows improved starting conditions and hole number 7 shows improved conditions for drill break-through. Hole number 1 is an improvement over number 2 by virtue of a cleaner starting surface.

The core drill shown in hole 3 of Figure 1 is a reminder to ask why should a hole be cored. If a cored hole is

***Through holes should not be specified
just to facilitate tapping operations***

used to improve density in a casting, eliminate a rough drilling operation, or to save a large amount of metal, then it is justified. The reason for coring a hole in cast iron should embrace at least two of these reasons. In cast iron, to core a hole below 1" in diameter, provided it has to be reamed after core-drilling is to invite trouble.

When drilling blind holes in cast iron in high production machines it is quite common to obtain 2,000 holes per grind at 70 feet per minute, using

a .375" high speed drill with .007" feed per revolution. If the blind hole is changed to a through hole drill life is reduced from 2,000 to 1,400 pieces per grind.

Most of the holes in Figures 1, 2, and 3 cause very poor drill life. The exceptions are holes number 1, 2, 7, 8, and 14. Drill life for hole number 19 of Figure 3 would be increased several hundred percent and drill breakage would be reduced if the break-through conditions were improved as indicated by the phantom

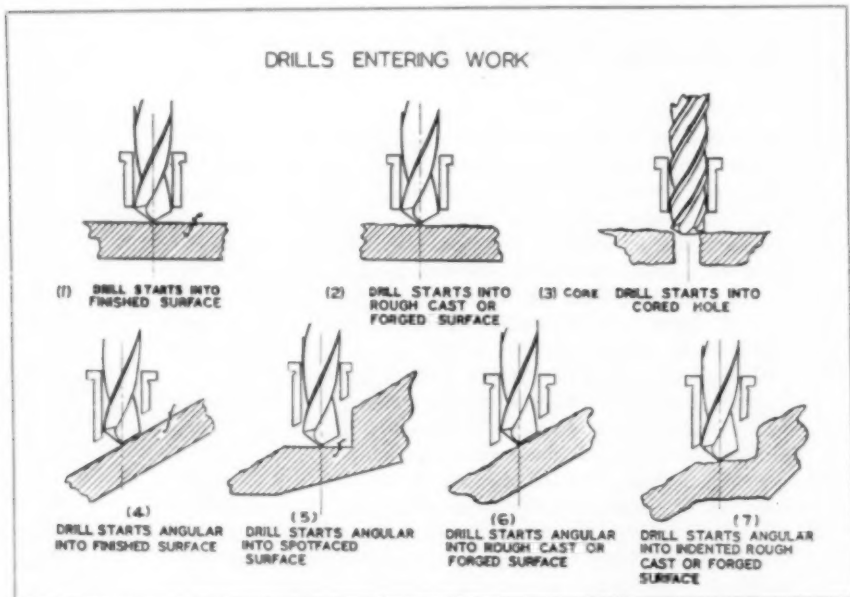


FIGURE 1

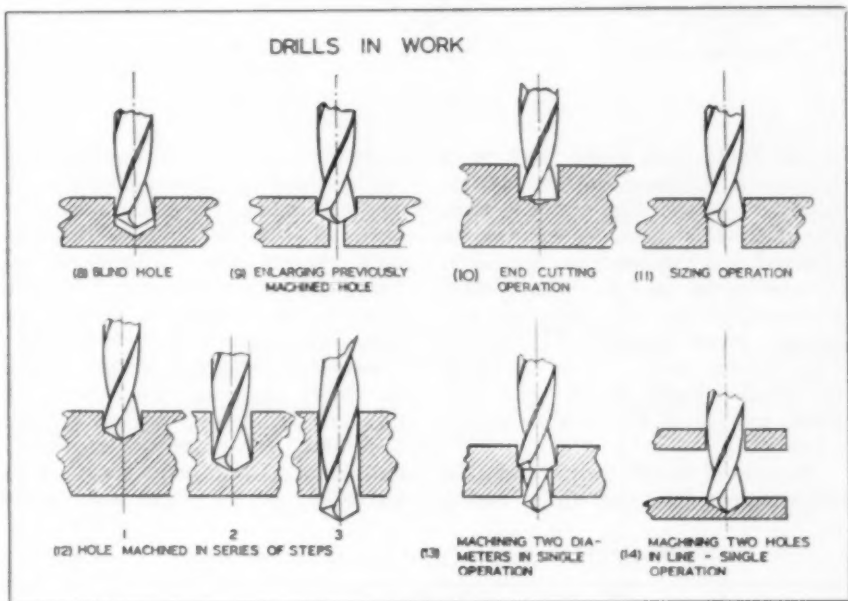


FIGURE 2

lines showing a flat surface for the drill to break through. It is suggested that some of the bushings shown in Figure 1 are not necessary.

Interrupted cuts are never easy for any cutting tool, let alone such poorly supported tools as two fluted twist drills.

A twist drill when drilling through holes goes through three distinctly different phases as shown in Figure 4.

The phases are the entering of the point until the margins are in the hole, then from the time the margins are in the hole and the drill has penetrated the material to the extent that the point or chisel starts to break through, the third phase is the breaking through of the com-

plete point. The amount of torque, thrust and penetration or feed is shown in Figure 4, by the three separate sets of figures which were recorded simultaneously.

As the drill enters the work in phase 1, the cutting forces rapidly increase and the machine is deflected from its unloaded position, causing a reduction in the feed.¹ Throughout phase 2, the torque thrust and feed remain sensibly constant. During phase 3 in a blind hole the actual feed of the drill continues after the feed mechanism has been disengaged until the machine has returned to its unloaded position, but in a through hole rapid changes in torque and thrust occur as the drill point breaks through the underside

of the work, and there may be a substantial increase in the instantaneous feed as the elastic energy stored in the machine structure is released and the machine returns to its undeflected position. This is often accompanied by vibration, so that during break-through the cutting edges of the drill may be subjected to specific loads far in excess of those set up under steady drilling conditions.

Records of thrust, torque and axial displacement of the drill during

break-through tests on a radial drilling machine are shown in Figure 4. The displacement record, which was obtained with strain-gage displacement meters, shows differences between the axial movement of the drill and nominal penetration. Torque and thrust rose steadily at first, and then remained substantially constant until the chisel edge was about to break through the lower surface of the workpiece, when thrust decreased, torque rose, and the actual feed increased. As the chisel edge broke

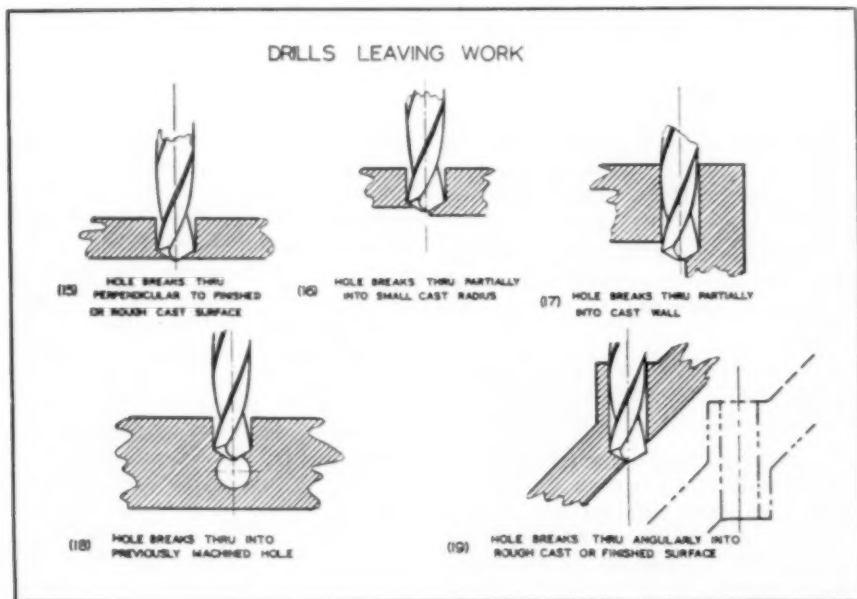


FIGURE 3

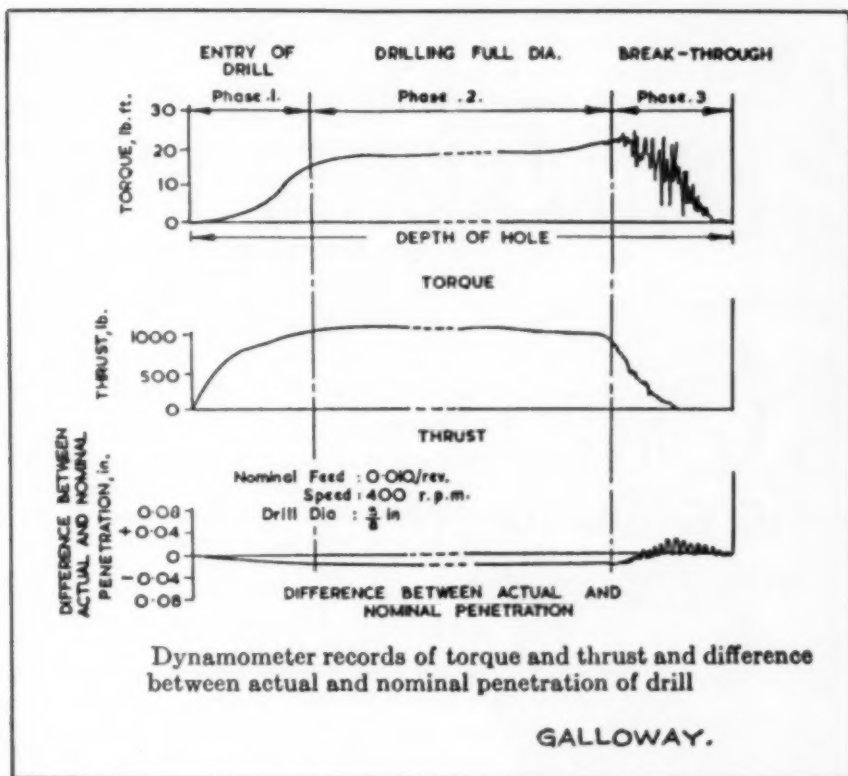


FIGURE 4

through, the machine began to vibrate and continued until the point of the drill had completely emerged from the hole. The vibration of the machine and drill was reflected in both the torque and thrust records, but particularly in the torque record, where the peak-to-peak fluctuations were almost as large as the average torque. During break-through the feed rose substantially, and thus the 0.020" displacement corresponding to the deflection of the machine was

regained as the thrust load acting on it was released.

The increase in average feed rate and the vibration set up during break-through impose severe loads on the drill. When the fluctuations of torque, thrust and penetration of the third phase of a simple and common through hole drilling operation are understood it can be easily seen why drills often break and always show poor drill life for holes such as numbers 4, 5, 6, 16, 17, 18, and 19. The

ENGINEERING & TOOLING continued

torque variations on the third phase for these holes will show a huge variation and a tremendous increase. The figures in Figure 4 were obtained by using a $\frac{5}{8}$ " diameter drill in mild steel.

At the beginning of the hole the drill point is piloted only by the drill margins at the outer corners. Thus

along a direction perpendicular to the diameter across the margins, the drill point is free to move substantially farther than the limits defined by the clearance between hole and drill diameters, at least until the drill has penetrated far enough for the margins to provide additional guidance for the drill.

After thoroughly analyzing Figure 4, it can be seen why blind hole drilling results in more holes per grind than through hole conditions.

Some product designers still specify through holes because of industry's former lack of ability to tap holes to the bottom of blind holes. Through holes should not be specified just to facilitate tapping because bottom tapping in blind holes is now a simple everyday achievement without breaking taps when modern tapping equipment is used. It is conceded that most shops today cannot bottom tap consistently and this is due to their failure to use modern tapping attachments and tapping knowledge.

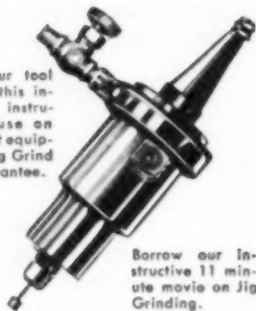
It can be seen that if the product designers were familiar with the cost of the various types of holes that are specified on most production drawings they would become designers for production. Much additional machine time can be gained by improved design of part which results in longer drill life, thereby having fewer tool changes that cause down time. When hole specifications and conditions are correct, the drills will be ground less frequently and require a minimum amount of grinding stock and will increase the grinds per drill. • • •

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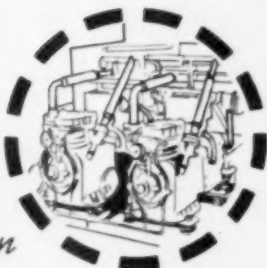
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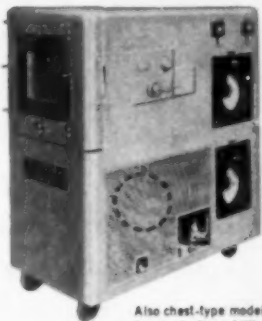
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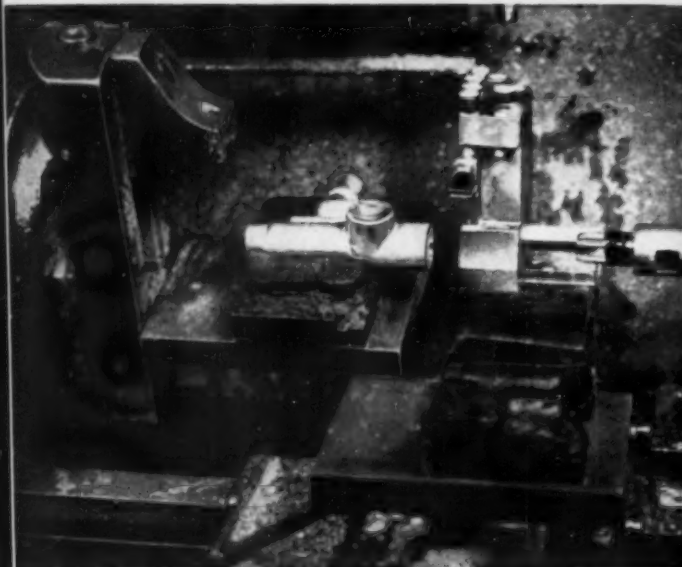


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THE PRACTICAL DIEMAKER



Which Rate Is Right When Pricing— \$6.00—\$7.00—\$8.00 Per Hour?

Part 2

■ Why do toolrooms of equal stature quote different prices on the same set of die prints? The reasons are ad infinitum, but can be categorized into the following main groups:

- I. Certain acquired know-how based on previous experience.
- II. Ignorance of inherent pitfalls in the job that cannot always be ascertained at the moment.
- III. Different types of machinery needed to do the job.

The last item (III) needs explanation. Let us take a typical example in Figures 1 and 2. If we were to be really technical about the two examples, Figure 1 should be quoted at about \$1.00 less per hour than Figure 2. My reasoning is that the first item involves the use of class B toolmakers whose hourly rate is less and the required equipment involved in producing the part is an ordinary plain mill, a drill press, and a surface grinder. Such general shop machines do not have a high maintenance cost and the initial investment is moderate, as machine tools go. On the other hand, the drawing shown in Figure 2 due to the tolerances involved requires not only the machine tools already mentioned, but also a

5

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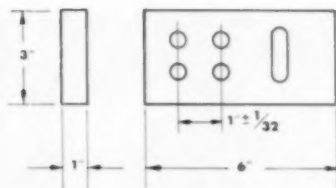


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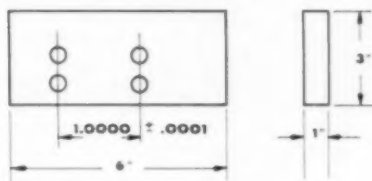
PRACTICAL DIEMAKER continued

FIGURE 1



Mill Square Up	1.0
Grind Sq. all over	3.0
Layout-Drill	1.0
Mill Slot	1.0
	<hr/> 6.0

FIGURE 2



Mill Square Up	1.0
Grind Sq. all over	3.0
Jig Bore	1.0
Jig Grind	1.0
	<hr/> 6.0

jig borer, a jig grinder, and lapping equipment. Accompanying this, elaborate inspection equipment and perhaps atmospheric control will be needed. In other words, the majority of hours required to complete the precision work is in the use of the plant's most expensive

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PRACTICAL DIEMAKER continued

equipment, highest skilled mechanics and close job supervision. Isn't it fair that the higher priced equipment be allowed an increased hourly rate factor to compensate for a just return?

Both parts have identical hours and are fairly the same in general appearance. However, notice that Figure 2 requires jig boring and jig grinding. If the going rate is \$7.00 per hour, Figure 1 would cost $6 \times \$7.00 = \42.00 .

Figure 2 is certainly worth much more but the bargain is the \$7.00 per hour rate. I believe consideration should be given due to the type of

machinery involved and \$8.00 would not be out of line. Hence $6 \times \$8.00 = \48.00 .

The above examples are used to demonstrate the need to re-evaluate the cost of quality and, conceivably, a dual rate could exist in a given shop. There could then be a base rate and other rates according to the value of higher quality and costly specialized machines and skills. Consideration for valued and acquired knowledge and equipment is becoming more important due to new emphasis on miniaturizing, exotic new metals, tightening of tolerances and over-all excellence in metal fabricating requirements. • • •

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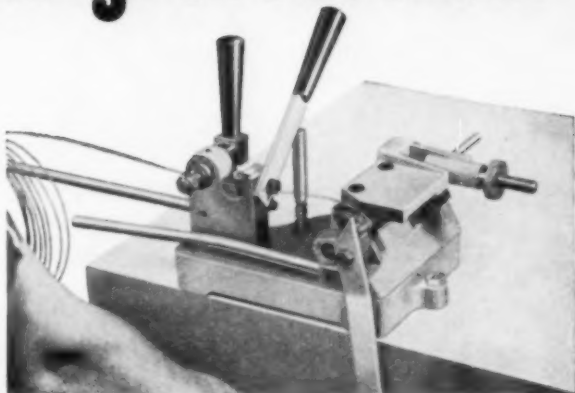
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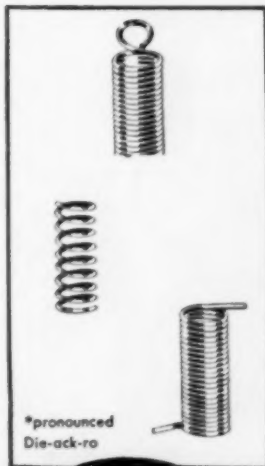
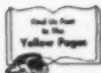
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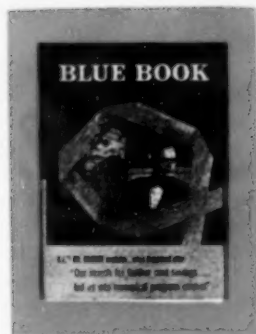
6



LEADERS OF THOUGHT IN INDUSTRY

Dr. W. W. GILBERT

Manager, Machining Development, General Electric Company, in an interview with **James B. Pond**



**explains what happened after—
“Our search for further cost savings . . .
led us into Numerical Program Control”**

■ *Dr. Gilbert, now that numerically controlled machine tools are coming into widespread use, what changes are taking place in machining procedures?*

A. For one thing, machine controls, including numerical program controls, are working into the area of the 70% unused machining time which is open to productive use.

Q. 70% unused machining time?

A. Several years ago our Process Development Laboratory began studies of the whole machining process to determine the actual costs of machining. Actual cutting times of typical machines were found to be as

high as 30% or as low as 2% of the working day. Thus, there was a minimum of 70% unused machine time available for further cost improvement. Of course, we know of jobs at our Steam Turbine Department where cutting time is as high as 90%; but, there the cuts are for days at a time! On operations typical of the job shop, where the procedure is essentially for one of a kind, cutting time can be surprisingly small.

Q. What steps have been taken to reduce this unused machine time?

A. After we devised reliable methods for predicting what speeds and feeds should be used within the limits of the cutting tool and the horsepower

of the machine, we looked into the cost savings of machine attachments and machine modifications which would improve the productivity of the machine. Fixtures were then examined to see if the work could be set up more quickly. We are using many new devices from our Tooling Development Laboratory. The next area under study was machine controls, which leads us into numerical program control.

Q. When you emphasize the word "program" in numerical program control, is there more involved than just the control system of a

machine's movements?

A. Let's look at the real problem.

A man must do the planning, and whether this man is the machinist or a planning specialist, it costs money. Our analysis of planning costs shows—even for low production of one to fifty parts—that if planning costs by the regular or old time methods are compared against computerized planning and the making of a tape through the computer, over-all costs are reduced by 2:1 or 3:1. Here's the area where numerically controlled machines can make a real breakthrough!

About Dr. Gilbert

Dr. William W. Gilbert is Manager of the Machining Development Laboratory in Manufacturing Services of the General Electric Company. He has been with General Electric since 1954 when he came from the University of Michigan to establish the Machining Development Laboratory. He has developed a machinability program for General Electric based on a scientific background but tailored for practical plant application. The Carboly Machinability Computer was designed and developed as part of this program. His present program is the application of machine tools with numerical programmed controls.

His undergraduate work was in Mechanical Engineering at the University of Colorado. During his graduate work at the University of Michigan he completed his master's degree in 1932 in aeronautical engineering, and his doctor of science

degree in 1935 specializing in metal cutting.

As a Professor of Production Engineering at the University of Michigan, Dr. Gilbert had charge of the machine tool laboratory and specialized in metal cutting research. Other courses under his supervision were machine tool design, jig and fixture design, measuring and gauging, and parts processing.

He is author of many metal cutting papers and was awarded the ASME Blackall Award in 1956 for "Distinguished Contribution to the Design or Application of Machine Tools, Gages or Dimensional Measuring Instruments."

Dr. Gilbert has completed the General Electric Professional Business Management Course, is a member of the ASTME Metal Cutting Project Committee and the ASME Production Engineering Division Committee.

Q. Are numerically controlled machines really economical for producing one part?

A. There are many cases where one part is complicated enough to be economically produced on a numerical program controlled machine. In that instance, you have a problem of accuracy and you can fixture the work once, machine one side, then another, and then still another side without re-fixturing—at a considerable saving in time.

Q. Several manufacturers of numerically controlled jig borers have pointed out the consistency of machine movements throughout the day, particularly when the tolerances are in tenths. In your opinion, what are the strong points of numerical control systems?

A. Repeatability is a very strong point in favor of numerically controlled machine tools. Another is the fact that the planning is done properly. It is done, and done right; the operator is not burdened with being both a planner and a machinist. The machinist can use his mechanical skills to the fullest advantage in operating the equipment while the repetitive calculating and paperwork is handled in the planner's office. In the future, the planner must know the machine's tricks, the details of setting up a particular machine, exactly what type of cutting tools must be used, and exactly what speeds must be specified. The planner must know what conditions are needed in order to get the right degree of surface finish and accuracy, how often the tools must be changed and to what specifications the tools must be sharpened. All this knowledge



"Because the new materials are so difficult to machine, our machine output has been reduced to a critical point . . . tungsten, moly, titanium, cobalt, and chromium are going into both jet engine materials and the cutting tools."

has to be put into definite form (written or documented) so that the planner can use it.

The planner of the future will have to be a much better qualified man than is the planner of today. He will have to have the knowledge of a machinist, one who tells you exactly how to do the drilling, exactly how to do the boring, and exactly how to do the tapping or reaming operation.

Q. Are new job titles being considered to describe the duties of these planners?

A. Yes, in a few of our plants we are setting up special qualifications



"What we are doing now is to put this (machining) information into definite sub-routines so that all details of selecting size of cut, speed, feed and cutting conditions can be obtained as standard information." . . . "In the future, the planner must know the machine's tricks, the details of setting up a particular machine, exactly what type of cutting tools must be used, and exactly what speeds must be specified."

Folklore knowledge is the experience one person relates to another, and he to another, and so on

for "Planner of Programmed Machines."

Q. Dr. Gilbert, how is the machining information being gathered?

A. We are making up programs which are being put into a computer to allow automatic programming of the repetitive details. For example, a print calls for 40 holes all equally spaced on a circle. The old method of using a jig borer, and having the operator compute each X and Y dimension, can now be replaced by a tape controlled machine with automatic computation and tape preparation. Even repetitive cuts of drill, bore and ream are programmed into the tape.

What we are doing now is to put this information into definite sub-routines so that all details of selecting size of cut, speed, feed and cutting conditions can be obtained as standard information. Many companies are using computerized programming such as the APT program developed by M.I.T., the Waldo program of Boeing, the Auto-Prompt program of IBM, and similar programs of Cincinnati Milling, Giddings and Lewis, and most of the aircraft companies. We are developing our own programs.

Needless to say, we are anxiously looking forward to the time when all this information is recorded so that we know exactly what should be done for each type of operation, instead of leaving this up to more or less the folklore type of operation.

Q. Folklore type of operation?

A. Yes, though I hesitate to use that expression. Folklore type of knowledge is the experience one operator relates to another, and he to another—which each in turn remembers. This knowledge, which is absolutely necessary to do the job, really is in an area of folklore because it is more or less intuitive information. An example of this might be the preparation of a cutting tool: honing the edge or grinding the point of a drill. Quite often the tool's geometry must be changed slightly by the operator in order to do the job he wants to do. This is the knowledge that the operator must have and without this he probably can't do the job satisfactorily, or at least not as well as he could if he did have it.

Q. How are you going to replace this folklore knowledge?

A. We are trying to get more information so we know exactly what is going on. In fact, when information is taped into a tape program you have to know exactly what you are doing, and you have to know exactly every move that is to be made.

Q. Dr. Gilbert, this recording of data for the computers to analyze is certainly a detailed program and one which will prove interesting to watch as the program develops. What are the smaller manufacturing concerns going to do, especially in view of the fact that the

***More true facts must be put into manufacturing,
there must be more science in those operations***

colleges probably cannot train men experienced in the details needed for programmed machines?

A. What should be done is a problem that has become of national importance. Our own General Electric Company is able to train our people; therefore, our attitude toward the colleges is to give the men an education heavy on strictly basic engineering knowledge. Then, when they come to us they are placed on a training program to specialize in the details of say, manufacturing.

A small manufacturer, on the other hand, expects the engineering graduate to be fully qualified to go in and start working on manufacturing problems. The present trend in education is to eliminate the practical portion of the educational program.

Q. What alternatives are the universities offering in their curriculums if they eliminate a practical portion of our education?

A. The trend has been to "Let's train our people in basic sciences." But, the meaning of the word *basic* is not described. This is a serious point. I think that there are basic sciences to manufacturing for which we must train. I think that our people need a lot more experience in the

application of engineering knowledge in order to put this knowledge to work.

Q. Are these changes in education contemplated or have some programs actually been dropped?

A. The production engineering curriculum at the University of Michigan has been consolidated back into mechanical engineering; M.I.T. is thinking of giving up their manufacturing shops, and the Ford Motor Corp. trade school has been disbanded. Many of the schools are giving up courses in foundry, heat treating, and even machining.

Q. This doesn't make much sense in view of the shift in emphasis to the white collar-push button age. What is to be done about future training?

A. We are getting into the stage where we have to put our knowledge into more definite form. Particularly if we go into these advanced types of machining. We have to know more about application.

We don't have our knowledge recorded the way we should. In many places we have theoretical knowledge far beyond that which we are using.

Here at General Electric, we have excellent engineers and we also have



"I think that there are basic sciences to manufacturing for which we must train. I think that our people need a lot more experience in the application of engineering knowledge in order to put this knowledge to work." . . . "We are getting into the stage where we have to put our knowledge into more definite form."

excellent manufacturing people. It may surprise you, but we spend more money on manufacturing operations than on engineering, so we train people in manufacturing just as we train them in engineering. In the past, manufacturing has depended more upon the trade school and the apprentice shop. Now, we are trying to upgrade the manufacturing area and put more true facts into manufacturing, to

put more science into it.

Q. Who is doing the manufacturing planning now? Is it still in Process and Planning?

A. The Advanced Manufacturing Engineering Service is working on the planning of the future but it is in the operating departments' planning areas where they have to decide which method of manufacturing to

***Fitting the new machines into production lines
will be an exciting challenge in the days ahead***

use today. It is here that we have groups who are analyzing what should be the processes to be used, what is the most efficient process depending upon the rate of production and the part to be produced. We call the group, "Producibility". The producibility section asks what are the functions of the part, what are the shapes of the part we want, and what should be the best process to be used to produce this part? We try to look at the economics and the problem of manufacturing, and of service, and analyze those before making the product so as to improve the efficiency of the method.

Q. Do the new materials, the high alloy metals, cause much trouble in manufacturing?

A. They have caused a very serious problem in manufacturing jet engines. Because the new materials are so difficult to machine, our machine output has been reduced to a critical point. We are seeking new methods of machining, new machinability methods, new tools. It may mean the use of electrolytic assist, it may mean that we will get into heat assist, it will mean getting into grinding.

Q. "Heat assist?" Do you mean Hot Machining?

A. Hot Machining, yes, to soften the work, but this may mean that we will need more heat resistant tool materials and learn how to use our

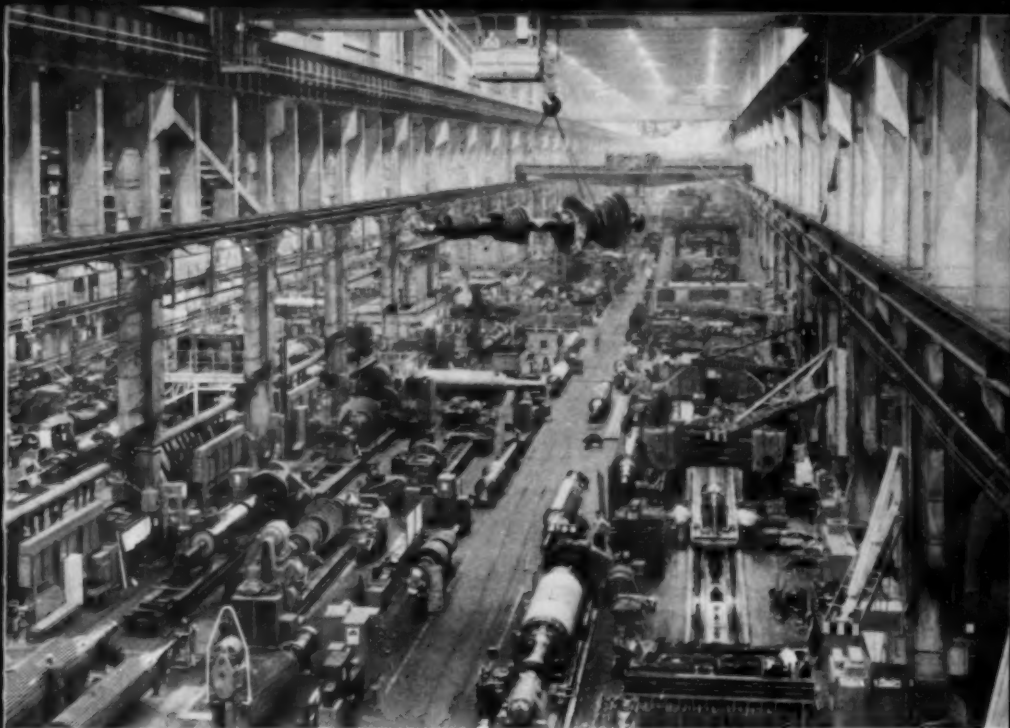
ceramic tools. We are going to *have* to do this in order to get back into an economical rate of production.

Q. What is the machinability of these tough alloys you are using in manufacturing jet engines?

A. Our problem here is that we have a high heat and an abrasion resistant condition to fight when the jet engine is in operation. The best alloys to resist these are the same alloys used to make cutting tools. In cutting, you know, we are really resisting heat and abrasion. What has happened is that the alloys and compositions which make a good cutting tool have been adapted into the alloys for jets. Tungsten, moly, titanium, cobalt, and chromium are going into both jet engine materials and the cutting tools.

These are the problems facing us today in machining. The answer may be in developing new carbides, new electro-chemical methods of cutting or to find entirely different methods of manufacturing such as sheet metal impact forming.

Many new machines were presented at the National Machine Tool Builders Show in Chicago. Every exhibitor had new machines, new controls and new tooling. It is an exciting challenge to fit these new machines into our production lines. Now more than ever it is wise to use these machines at their maximum potential which means putting them into a well planned manufacturing system. • • •



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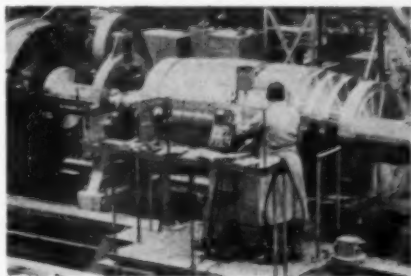
■ The view above shows one of the most fascinating machine shops in the world, General Electric's Large Steam Turbine-Generator Department at Schenectady, N.Y. Stretching more than one-fourth of a mile, this huge structure contains nearly 1300 major machine tools—some being the largest in the world—which are devoted to producing electric power generating machines for the nation's electric utilities.

As recently as June, 1959 the firm unveiled a multi-million dollar array of automated machine tools which featured many interesting developments in the use of numerical control.

In his interview, Dr. Gilbert mentions installations where the cutting time is as high as 90% since the cuts are for days at a time. A good example might be that as shown at the left where a big Betts lathe is being used

for grooving turbine rotors ranging up to 20' in length, up to 52" diameter, and weighing up to 40 tons. The grooving operation is being performed here with carbide insert tooling: a single-head toolholder on the rear slide, a twin-head toolholder on the front. ●●●

. . . cuts last for days



Wood Construction For Jigs And Fixtures?..

By **Harold Sedlik**

Stanley Tools, New Britain, Connecticut

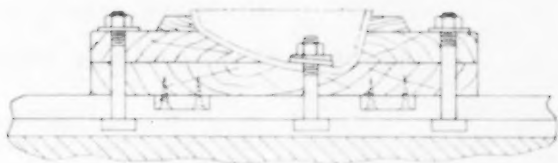
■ For limited or experimental production, don't jump to the conclusion that it is impractical to design and fabricate conventional jigs and fixtures because the initial cost cannot justify a return on the investment. Jigs and fixtures offer enough important advantages, such as improved interchangeability and increased accuracy of the parts manufactured, to warrant their construction for limited runs.

To build jigs and fixtures economically for small-lot production, many of the basic fundamental principles of tool design cannot be observed. Frequently, unconventional principles may be employed purposely to minimize tool cost. A very good example, which in recent years has become increasingly popular, is wood fabricated jigs and fixtures. However, it should be clearly understood at once, that jigs and fixtures constructed of wood are *not* normally recommended for extremely close tolerance work or where heavy machining and abuse may be anticipated.

Why Wood Works So Well

Wood is favorable for jig and fixture construction, as it is inexpensive, light weight and can be readily machined or formed with very little difficulty.

Wood is perhaps man's most available construction material and it is also considered a non-strategic material which should prove beneficial in the event of a national



... Why Not?

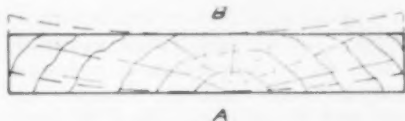
emergency. Wood has many excellent physical properties, namely, very high compression strength; in some cases higher in proportion to its weight than steel. It has low tensile strength and moderate shear strength. In addition, the linear expansion of wood per degree of Fahrenheit is less than one-half that of steel. (Linear expansion per degree Fahrenheit—wood = .0000028, steel = .00000636.)

The principal disadvantage of wood is its tendency to warp, shrink or swell. However, the above condition can be minimized through a better understanding as to its cause.

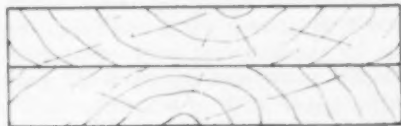
Why Wood Warps

Wood is composed of numerous minute cells and tubes. It is the varying amount of moisture in wood that changes the diameter of these tubes and cells, hence, causing a board to shrink or swell in width and thickness and seldom in length, since the tubes lie in this direction. The tendency for a board to warp is usually a result of the difference of shrinkage

or swelling between new and old cells and tissues within the wood. The inner side "A" (Figure 1) of the board, being closer to the heart of the tree (as indicated by the annual or growth rings), is older than side "B"; therefore, its cells are firmer and more compact than those of "B". As a



1. Why wood warps. The inner side "A", being closer to the heart of the tree, is older than side "B". Its cells are firmer and therefore shrink or swell less rapidly than the newer, open called "B" side.



2. Laminated construction, a process of gluing two or more boards together, offsets warpage tendencies. To obtain maximum results place together two outsides or two insides.

Wood construction greatly simplifies the holding of complex shaped parts

board seasons or becomes moist, the newer and more opened cells of side "B" shrink or swell more rapidly and to a greater extent than those of "A"; consequently, causing a board to draw or warp in the direction indicated by the dotted lines.

The foregoing condition can be corrected to some extent through laminated construction. Laminated construction is a process of gluing two or more boards together. To obtain maximum results from laminated construction, it is often necessary to reverse the grain of the pieces that are to be glued, and placing together two outsides as "B", or two insides as "A" Figure 1. This is thoroughly illustrated in Figure 2.

Which Wood?

In general, a hard wood is recommended for jig and fixture construction such as maple, as it possesses many favorable qualities. However, for jigs and fixtures subjected to light duty, it is possible to use white pine. White pine is a soft wood which is inherently light weight, straight grained and can be worked easily. Also, white pine will not warp, shrink, or check as readily as most other woods. Its glue-holding qualities cannot be excelled and very few woods can be more easily penetrated and secured with nails or screws.

Marine plywood, or plywood bonded with a moisture resistant glue, can also be used successfully for jig and fixture construction as it is strong

and light weight. Plywood consists of two or more thin sheets of wood thoroughly bonded together. The sheets are bonded with the grain in different directions, generally perpendicular to one another, so that the resultant sheet of plywood is equally strong in all directions. However, its life and effectiveness are dependent upon the glue binder.

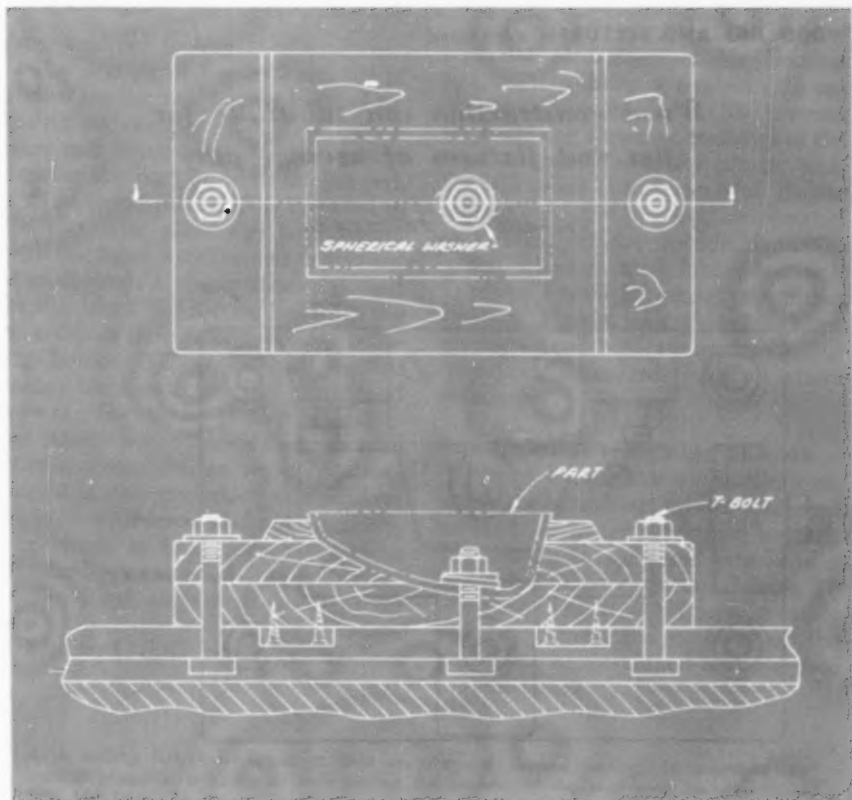
Protecting the Pores

It is very important that wood details be given a protective coating to seal the open cells or pores. For normal conditions, two to four coats of shellac or lacquer should provide adequate protection. The sealing of the pores will reduce future swelling and warping caused by the absorption of atmospheric moisture, or various oils and coolants used in conjunction with jigs and fixtures.

Placing Protective Points

The term "wood construction," in reference to jigs and fixtures, is perhaps misleading, as very seldom will a jig or fixture be totally constructed of wood. Quite frequently to maintain part orientation and reduce wear, it usually becomes necessary that wood fabricated jigs and fixtures utilize steel component parts such as locators, stops, wear plates, etc. Many of the above components are commercially available and should be utilized when feasible.

As stated previously, wooden jigs and fixtures will not sustain abuse as conventional tooling and in addition,



3. Drill jig constructed of wood. To reduce wear and depression into the wooden base as the part or work is clamped, a sheet metal plate "A" is fastened to the top. The wooden bushing holder, "D", is fastened to the spacer block with two flat head wood screws; the bushing is of the type used for plastic tooling.

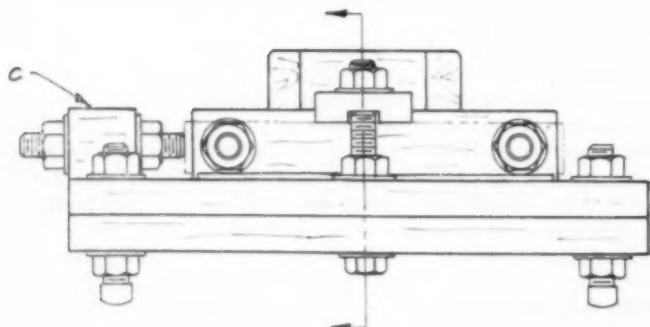
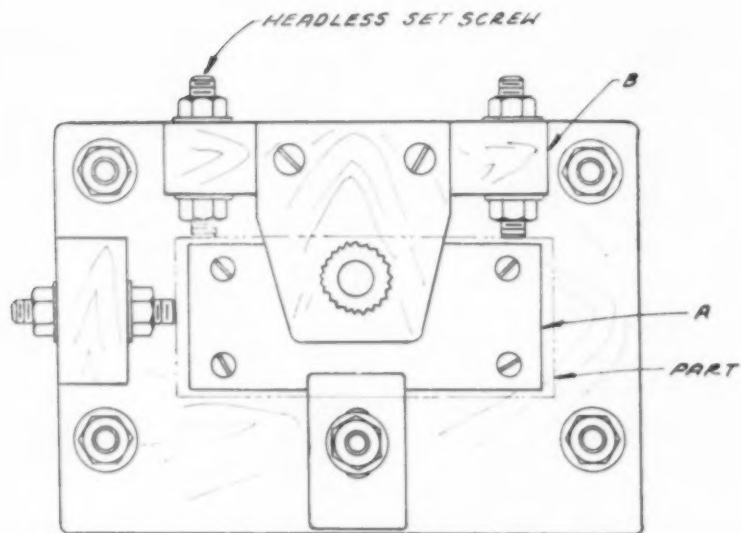
they are limited to more or less the non-precision category of the work. Wood construction, however, can in most cases substitute for expensive conventional jigs and fixtures of the average duty variety. Also, wood is desirable in large fixture structure as a means of reducing material expense.

Designing The Jigs And Fixtures

The design of wood constructed jigs

and fixtures is basically similar to equivalent conventional tools. The designer, however, must give consideration to the many unusual conditions which wood fabrication presents. To better illustrate, an example is shown in Figures 3 and 4. The wood constructed drill jig (Figure 3) and milling fixture (Figure 4) are simple; nevertheless the design principles presented may offer many suggestions to

*Wood construction can substitute for
jigs and fixtures of average duty*



more complex tooling.

The drill jig of Figure 3 consists of a base having two boards bonded together in reverse grain. To reduce wear and depression into the wooden base as the part or work is clamped, a sheet metal plate "A" is fastened to the top. The plate can be fastened with flat head wood screws or bonded if so desired. A spacer block "B" and locator block "C" are cemented to the base top as shown. The wooden bushing holder "D" is fastened to the spacer block with two flat head wood screws. The three stops or locators are standard headless set screws with nuts and washers. In wood construction, it is very important that washers be used with screw and nut assembly. The work is held securely with a standard commercial clamp. Four square head set screws serve as jig feet.

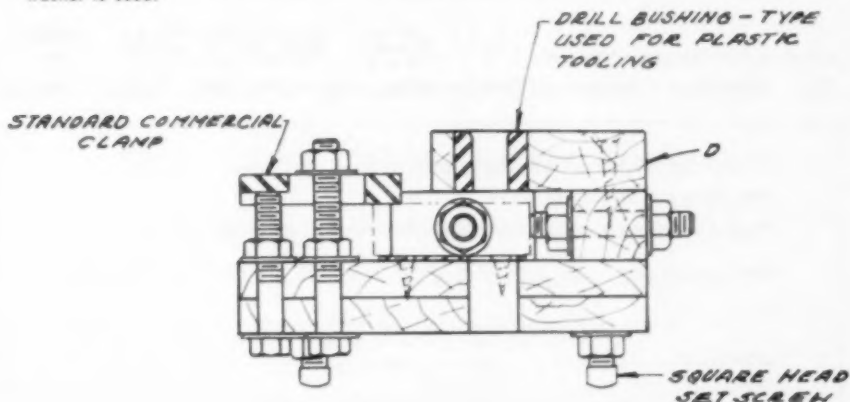
Standard drill bushings are not

normally recommended for wooden jigs, as they have a tendency to rotate and become loose. To prevent the foregoing situation, bushings of the type ordinarily used for plastic tooling will prove quite successful. Plastic tooling type drill bushings are serrated or knurled on the outside diameter, which when pressed into wood will form an interlock, hence preventing rotation. Plastic tooling bushings are readily available commercially to American Standards Association standards.

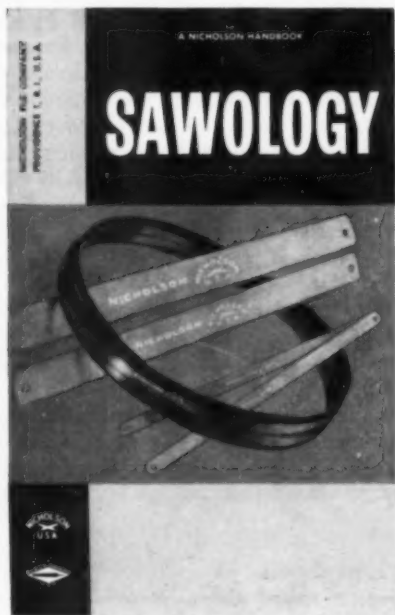
For Holding Irregular Shapes

Figure 4 illustrates an excellent example of a milling fixture designed to hold an irregular shaped casting. The fixture is composed largely of a laminated wood constructed base. To orientate the casting properly, a cavity or nest having the contour of the part must be developed into the base

4. A milling fixture designed to hold an irregular shaped casting. To orientate the casting properly, a cavity or nest having the contour of the part must be developed into the base. To assure equal pressure upon the part when clamping, a spherical washer is used.



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as shown. Owing to the fact that wood is inherently free machining, the nest can be formed with very little difficulty. On the other hand, duplicating the part form into a similar conventional steel base fixture would have required expensive equipment and presented many problems.

The work or casting is clamped by means of a nut and T-bolt fitted to a corresponding T-slot of the milling machine table as illustrated in Figure 4. Also, to assure equal pressure upon the part when clamping, a spherical washer is required. Two standard keys are fastened to the fixture base to provide alignment with milling machine table.

Got To Remember Costs

Another important factor which we should bear in mind is that the cost of a jig or fixture increases proportionately to the degree of accuracy required. The tolerance of a jig or fixture is generally established accord-

ing to the accuracy of the operation it is to perform. Nevertheless, it is feasible to build a jig or fixture that would not require a great degree of accuracy and yet would produce satisfactory results. This can be accomplished through the use of adjustable locators or stops. The drill jig in Figure 3 is a very good example, as it would not be necessary to locate the drill bushing accurately, as the three set screw stops can be adjusted to suit.

Jigs and fixtures designed with adjustable locators or stops are more economical to build as accuracy is not required, but induced at assembly through adjustment of screw stops.

Presented were but a few of the many advantages and uses of wood in jig and fixture construction. The number of principles and applications is limited only by the intelligence and ingenuity applied by tool designers in devising means to reduce tooling expense. . . .

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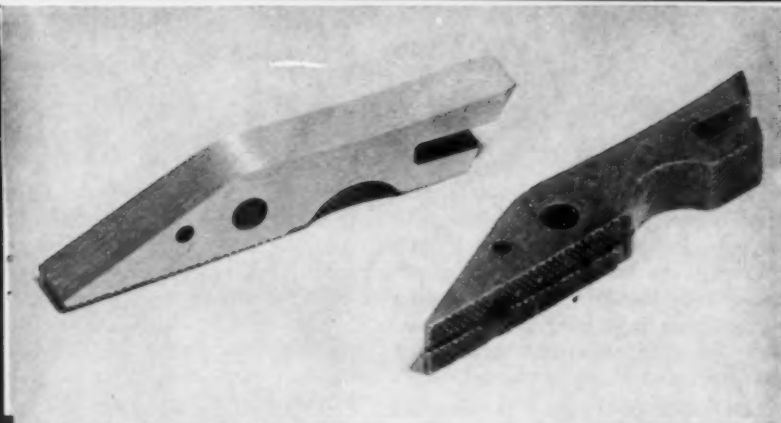
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1. Two jaws for hand pliers shown in the before and after stage of manufacture. The top form and the sides of the jaw are machine ground on a rise and fall abrasive belt grinder.

New feature enables

Abrasive Belt Grinder To Displace Hand Grinding!

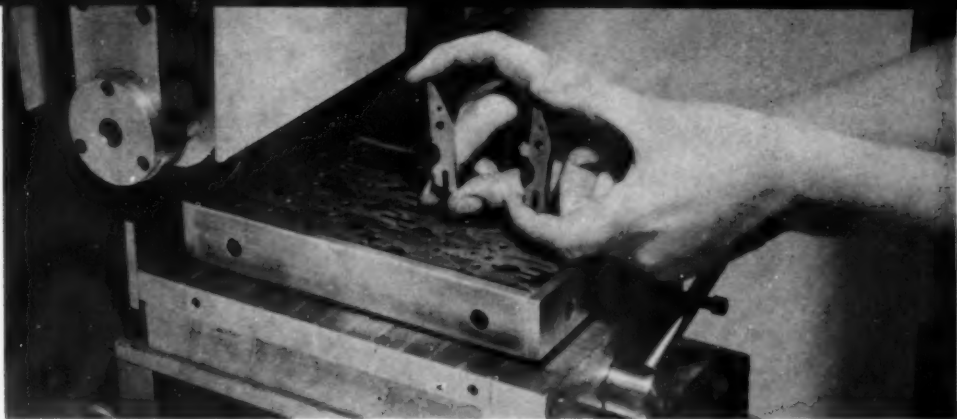
By **C. E. Wesson, President**

Eastern Machine Screw Corporation, New Haven, Conn.

■ Is it really necessary to grind forms and contours on small parts by hand, grinding one piece at a time against an abrasive belt or wheel? This is important because the low rate of production of this time consuming hand operation has long been a thorn in the side of production people.

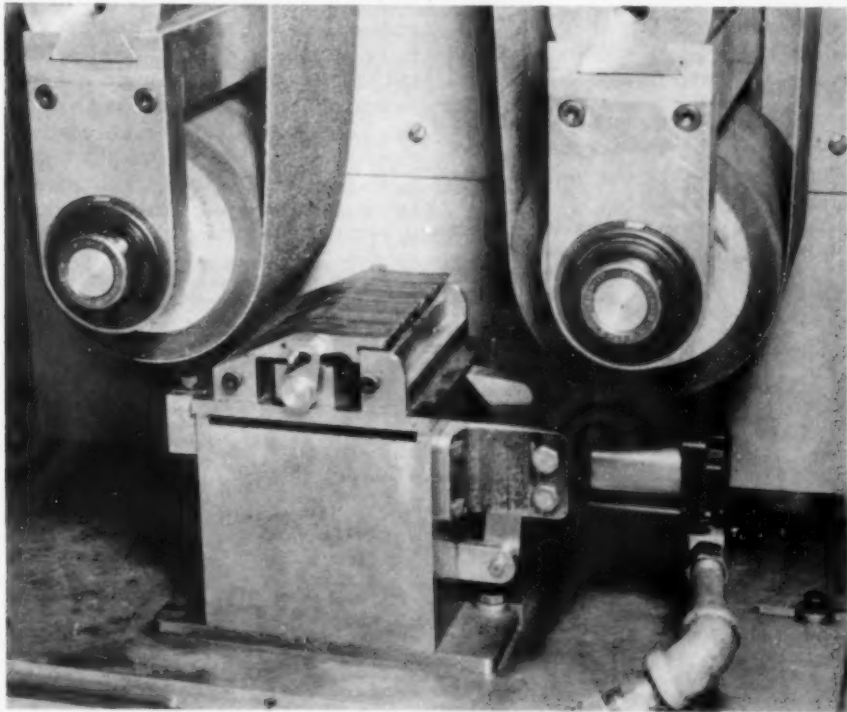
Even with skilled grinding hands, fatigue and other factors result in considerable rejects, running as high as 25% at times. Then too, hand operations usually mean lack of uniformity of grinding and uneven wear on the abrasive belts. This latter is costly and is the result of the operator changing grinding pressures.

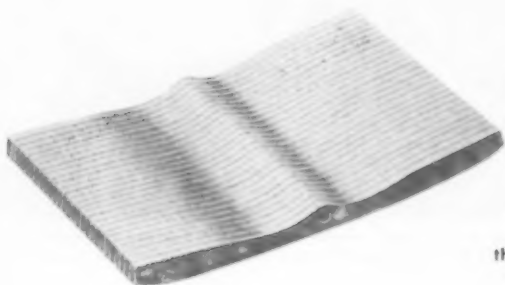
A solution to many of these grinding problems has been found in the Loungway Rise and Fall Abrasive Belt Grinding Machine, which not only enables a metalworking manufacturer to grind flats, forms and contours, but



2. Sides of the plier jaw are ground on a single spindle model of the Loungway grinder. The fixture holds 32 jaws. Two grinding passes are given to these parts in one cycle to complete the operation.

3. The form on the top of the jaws is rough and finish ground in one operation. Where the job was formerly a hand operation, fixturing and the automatic features of the rise and fall grinder permit the handling of 13 jaws per operation.





4. These are jack knife springs. When held in groups of 28, the machine can rough and finish grind at the rate of 2,500 per hour. Hand grinding previously produced only 500 per hour.

permits work on ganged parts. Additionally, both rough and finish grinding can be done in one operation.

The double spindle model of the grinder provides the greatest opportunity to utilize the rise and fall features of the machine. This model generally is set-up to give two rough grind passes and one finish grind pass. An example of this is shown in Figure 2.

The 13 plier jaws are held in a jig which is just approaching the left-hand spindle for the first rough grind. In operation, the loaded jig would be attached to the fixture in its stop position to the right of the right-hand spindle. When the start button is pushed, the right-hand spindle is automatically raised out of the way to permit the workpieces to pass underneath. The first index position is to the point just prior to the first rough grind, which is to the right of the left-hand spindle. Then the parts are

ground, the table reverses and indexes in fast travel up to a spot just to the left of the left-hand spindle for the second rough grind pass. As soon as this grind is finished, the table again rapidly indexes up to the point just to the left of the right-hand spindle for the finish grind. After grinding, the table stops for reloading.

The rise and fall feature of this belt grinder is obtained by the use



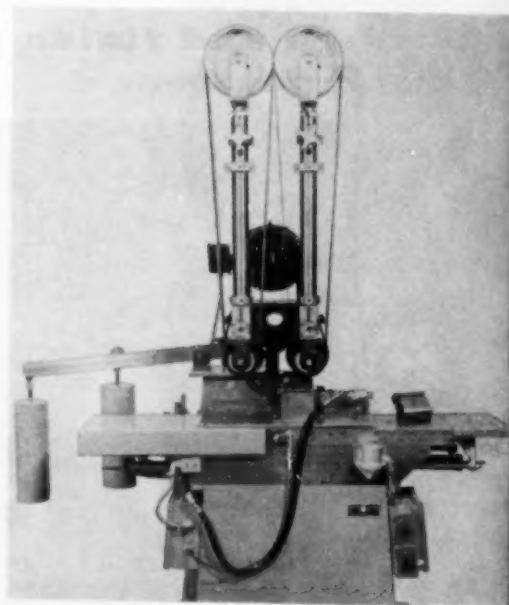
5. The top of this 12 gauge shot gun receiver and the sides are ground on abrasive belt grinders. Both were formerly hand grinding operations.

of a cam follower traveling over a cam that is attached to the work fixture. The cam follower is on the spindle assembly and operates against the cam by gravity, although pressure is adjustable by the use of a counter-balance assembly.

A variation of the double-spindle grinder is shown in Figure 7. This special spindle assembly was designed to grind the form and contour of the top of a 12 gauge shot gun receiver. The concave form of the lower pulleys provides the contour shape for the top and the cam follower raises the spindle assembly as the work pieces are fed into the grinding area.

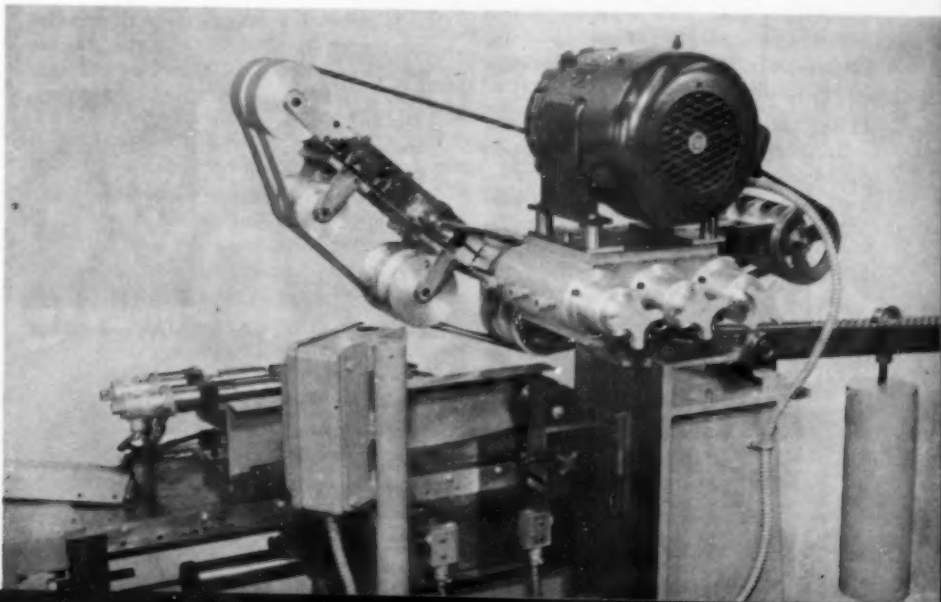
Widespread applications are envisioned for the Loungway grinder. Wherever hand grinding is now done on small parts because the parts have forms and contours, another look is in order. Perhaps the job might be suited to automatic grinding equipment.

• • •

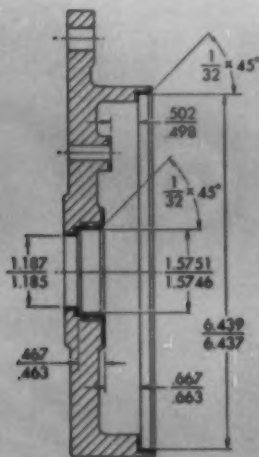


6. This is a double spindle Loungway Kise and Fall Abrasive Belt Grinder. The setup shown here is for grinding the tops of the jack knife springs shown in Figure 4.

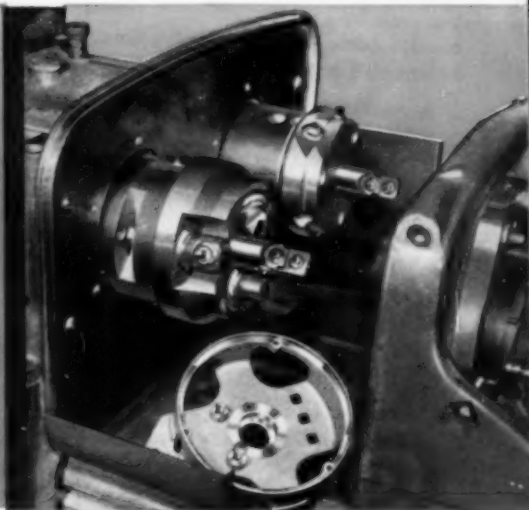
7. A variation of the double-spindle grinder designed to grind the contoured top and form of the shot gun receiver shown in Figure 5. This view is of the back side of the machine. Note the use of contoured lower pulleys which shape the belt during grinding.



9 surfaces rough and finish machined in 2 passes...



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Should You Or Shouldn't You Use Numerical Control?

*Here's a checklist
to help you decide*

EAST AURORA, N.Y.: Automatic numerical control for machine tools is still costly, but it can cut skilled labor time up to 80 per cent, reduce tool wear, lessen lead time and increase precision—if your plant is ready for it.

To offer some yardsticks to guide management decisions in machine tool automation, an equipment control expert has come up with a checklist for numerical control, as well as some tips on planning a system if the decision is "yes."

William C. Moog, president of Moog Servocontrols, Inc., and a designer of control systems, advises that management ask itself these questions when deciding, "Is numerical control worth it?":

- (1) In terms of sales and plant efficiency, is it vital that lead time be cut to a minimum?
- (2) Are the operations of your machine tool section complex and varied?
- (3) Are there several operations involved in your machine set-up?
- (4) Is the running time of your machines out of proportion to machine set-up time?
- (5) Are your products so diverse, in type and dimension, that it is impractical to maintain a large inventory of finished parts?
- (6) Is there excessive wear on your machine tools?

- (7) Are you frequently required to produce highly complicated parts in short production runs?
- (8) Is the hazard of possible human error or gaging error a continual threat, due to high precision requirements of complex parts?

If your answer is "yes" to several or all of these questions, it may be a wise step to investigate any of more than 40 different types of numerical control systems that can automate machine tools from programmed tape. However, even after the problem has been recognized and the decision made, a great deal of time, effort and

money can be wasted unless tool automation is established properly. For the manufacturer who is ready, Moog suggests this plan of action:

1. Systems Investigation—Find out what is available. Obtain as many comprehensive and comparative specifications as possible regarding the dozens of numerical control systems on the market. Cross-check to determine which types will best serve your needs and effect the greatest cost savings in terms of purchase price and upkeep.
2. Cost Analysis—Some automation applications will be of more potential value than others. Through a complete study of your production costs, including skilled labor wages, tool wear, tool operating time, inspection time and other factors, select the areas where numerical control will be of greatest savings.
3. Determination Of Specific Machine Requirements—Analyze the exact requirements of each machine scheduled for possible automation. Then match these requirements with specific systems under consideration.
4. Evaluation—Narrow down the selection of possible systems and discuss your needs with each supplier. In many cases alternatives can be suggested by the supplier, based upon experience with other operations similar to

RIVETERS.



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head rivets from smallest to $\frac{3}{4}$ " diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—sizes to meet all needs—types include Vertical and Horizontal Multiple Spindle.

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THE GRANT MFG. & MACHINE CO.
CE Station Bridgeport 3, Conn.

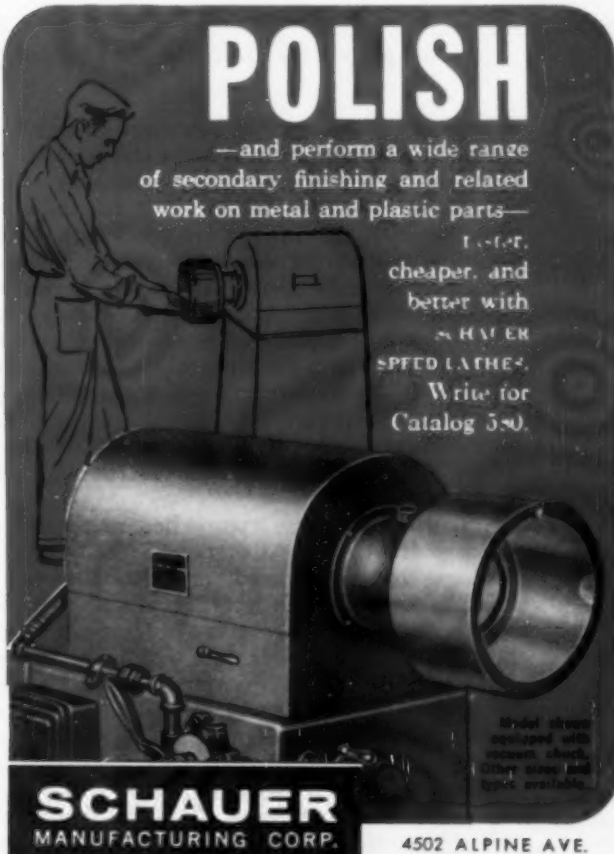
Use postpaid card. Circle No. 390

yours. Obtain quotations from each and plot long range dollar savings according to anticipated production requirements.

5. Integration—Discuss all phases of the conversion with production staff. Often they will have suggestions on how the system can be further used to advantage, how the production

rate increase will affect other departments, how schedules might be modified to meet the new rate. In this way, your numerically-controlled machines can be put to maximum use while operating in smooth coordination with all other phases of the production process.

• • •



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TOO MANY BELTS IN THE CLOSET!

*Belt grinders have tensioning devices,
so why 104 belts to do the job of 31?*

■ Realizing that the list of belt specifications for abrasive belt grinders was growing by leaps and bounds, the Coated Abrasives Manufacturers' Institute recently took a count and found that 104 different belt lengths covered the range between 12" through 168" in length. Perhaps they missed a few in the count but enough were noted to establish that belts were being made in increments of sixteenths of an inch. As an aid to reducing complexities of ordering and expense of inventories, the Institute has now embarked on a program to standardize belt lengths.

A committee, formed to study the situation, presented a proposal it believed would bring relief without harassment: why not make belts in 31 lengths, from 12" through 36" in 3" increments, and from 42" through 168" in 6" increments?

Next, the committee approached machinery manufacturers, pointing out that of the 278 belt-using machines tabulated, 154 were already made to take one of the 31 proposed lengths. This left 124 machines which would require other measurements. The committee asked machine builders to review any of their machines among the non-conformist 124 with a view to adjusting them to fit the nearest proposed standard and to please apply the new standards when designing new machines.

Existing abrasive belt grinders, the committee suggested, might be modified inexpensively by revising tensioning devices or by changing pulley diameters. It suggested that such steps would aid both industry and distribution, developing wider usage of belt machines as well as reducing

ABRASIVE BELT LENGTHS

(3)	PRESENT LENGTHS	PROPOSED LENGTHS	(4)	PRESENT LENGTHS	PROPOSED LENGTHS
	6" INCREMENTS			6" INCREMENTS	
	76"	78"		118"	120"
	77"				
	78"				
	79"				
	82"	84"		122"	126"
	83"				
	84"				
	85"				
	86"	90"		128"	132"
	88"				
	90"				
	91"				
	91-1/2"	96"		133"	136"
	92"				
	93"				
	96"				
	98"	102"		134"	144"
	100"				
	101"				
	103"				
	104"	108"		136"	150"
	105-1/2"				
	106"				
	107"				
	108"	114"		140"	156"
	111"				
	112"				
	115"				
				141"	162"
				144"	
				145"	
				148"	
				150"	168"
				152"	
				156"	
				160"	
				162"	170"
				164"	
				166"	
				168"	
				169"	171"
				170"	
				171"	

continued on next page

dealer inventories.

Response from the machine industry has been prompt, and almost unanimously favorable—the exceptions being one or two firms which explained that patented features would be vitiated by the proposed change.

Most respondents pledged fullest cooperation in the future.

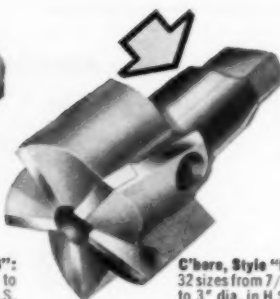
Institute members include: Abrasive Products, Inc., South Braintree, Mass.; Armour Alliance Industries, Alliance, Ohio; Atlas Abrasives Corporation, Greenwich, Conn.; Behr-Manning Co.,



Core Drill: 25 sizes from 1½" to 3" dia. in H.S.S.



C'sink, Style "B": 6 sizes from ¾" to 2" dia. in H.S.S.



C'bore, Style "B": 32 sizes from 7/16" to 3" dia. in H.S.S. and carbide.

stub taper drive makes a difference in tool cost

Scully-Jones counterbores, countersinks, and core drills with stub taper drive reduce tooling costs three ways. Replacement cost is lower because these tools have two parts—a cutter with stub shank and a driver. Only the cutter is replaced when worn out. The tough, hardened steel holder can be reused time after time.

They save indirect costs, too, because short, yet rigid and accurate, stub taper shanks are easy to insert and eject. They speed setup and tool change. When countersinking follows core drilling or counter-

boring, you simply switch cutters—in seconds—the holder stays in the machine.

Other savings come from elimination of cutter damage and scrap. The tang on the stub taper shank mates with a slot in the holder—provides a positive, slipproof drive.

For complete information on this unique tooling method, see your Scully-Jones distributor or representative, or phone: Blshop 7-5900.

Scully-Jones and Company

1907 South Rockwell Street, Chicago 8, Illinois



Styles 1 and 2 holder with 20° flutes to aid chip removal.



Style "B" holder for counterboring, countersinking and shallow core drilling.



CUTTING TOOLS

ABRASIVE BELT LENGTHS

(1) PRESENT LENGTHS	PROPOSED LENGTHS	(2) PRESENT LENGTHS	PROPOSED LENGTHS
3" INCREMENTS		6" INCREMENTS	
12"	12"	40-3/16"	42"
15"	15"	41"	
17-3/8"	18"	42"	
20"	21"	44"	
21-5/16"	21"	44-1/4"	48"
21-3/4"		44-1/2"	
23-3/4"		45"	
24"		45-1/2"	
25"	24"	47"	54"
25-1/2"	27"	48"	
26"		48-5/16"	
27"		50"	
28"	30"	52-1/2"	60"
28-1/8"		54"	
29-3/4"		54-1/2"	
30"		56"	
31-1/2"	33"	57"	66"
35"	36"	58"	
36"		59"	
36-3/4"		60"	
37-1/4"		61"	72"
37-1/2"		64"	
		64-3/4"	
		70"	
		70-1/2"	
		72"	

TOO MANY BELTS continued

a division of Norton Company, Troy, N.Y.; The Carborundum Company, Niagara Falls, N.Y.; Clover Manufacturing Company, Norwalk, Conn.; Michigan Abrasive Company, Detroit, Mich.; Mid-West Abrasive Company,

Owosso, Mich.; Minnesota Mining & Manufacturing Co., St. Paul, Minn.; and Sandpaper, Inc., Rockland, Mass. Offices of the Coated Abrasives Manufacturers Institute are at 711 Third Avenue, New York City. • • •

Leece-Neville reveals how a . . .

Simple Automated Setup Promoted Production Economy

By **G. B. Howell**, Vice President—Manufacturing
The Leece-Neville Company, Cleveland, Ohio

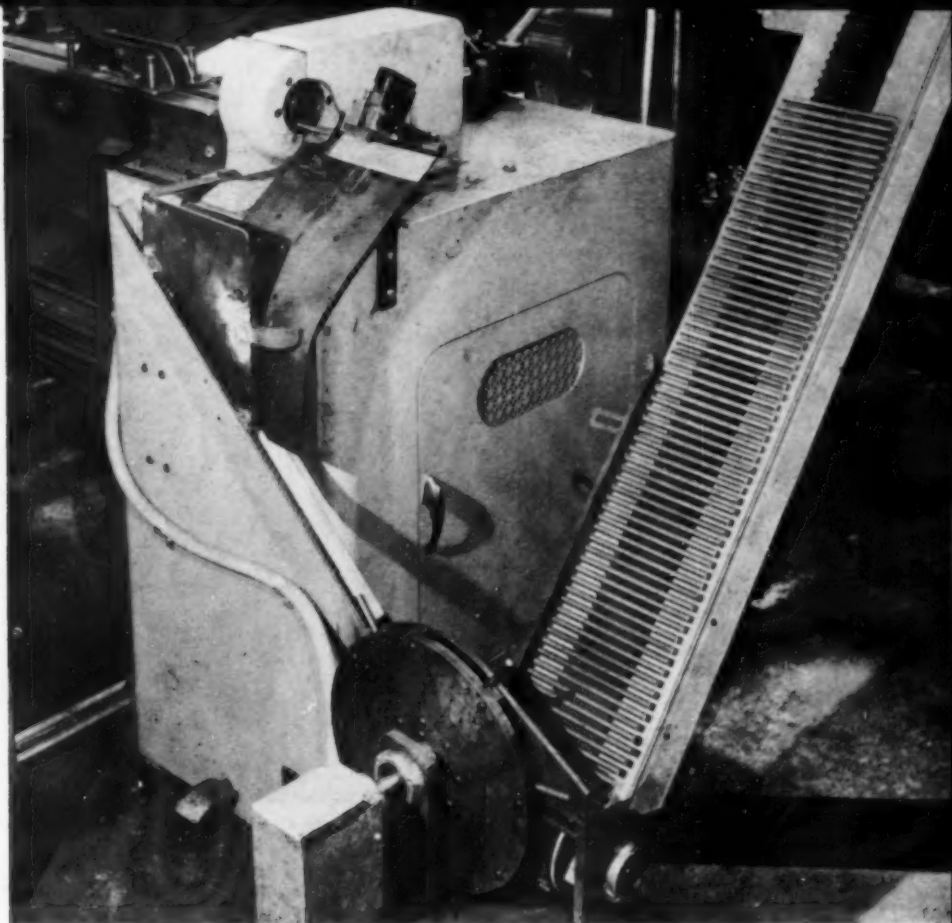
■ Shafts for small motors, such as are used to drive blowers for automobile heaters, windshield wipers and the like, are produced in large volume in one of the Leece-Neville plants in Cleveland, Ohio. Such work is done in a new and well automated line.

At the start of this line, cold rolled bar stock of specified size is loaded into a rack from which one bar at a time, fed by sprockets, falls automatically into a track shown at upper left in Figure 1. When so located, the bar is fed axially along the track to a stop set to yield pieces of required length when the wheel of the DiAarco cut off machine shown makes its cut.

As each cut shaft drops from this machine, the shaft falls down a chute into radial position in the slow turning wheel that appears in the foreground of Figure 1. After angular advance by this wheel, each shaft is discharged onto the cleated rubber belt of a short conveyor for advancing the shafts up the incline.

At the top of this conveyor, the shafts are discharged, one at a time, into the inclined magazine of the special machine pictured in Figure 2. From the bottom of the magazine, an air-hydraulic device, controlled by solenoid valves, releases one shaft at a time and clamps it against a V-block in line with the two Dumore heads of the machine.

Each head carries a chamfering tool that is advanced to make its cut and then is retracted. Thereupon, the shaft, with both ends chamfered, is unclamped and is kicked into a chute down which the shaft slides axially into the track of a Federal conveyor that feeds the first to two Cincinnati centerless grinders, placed in series.

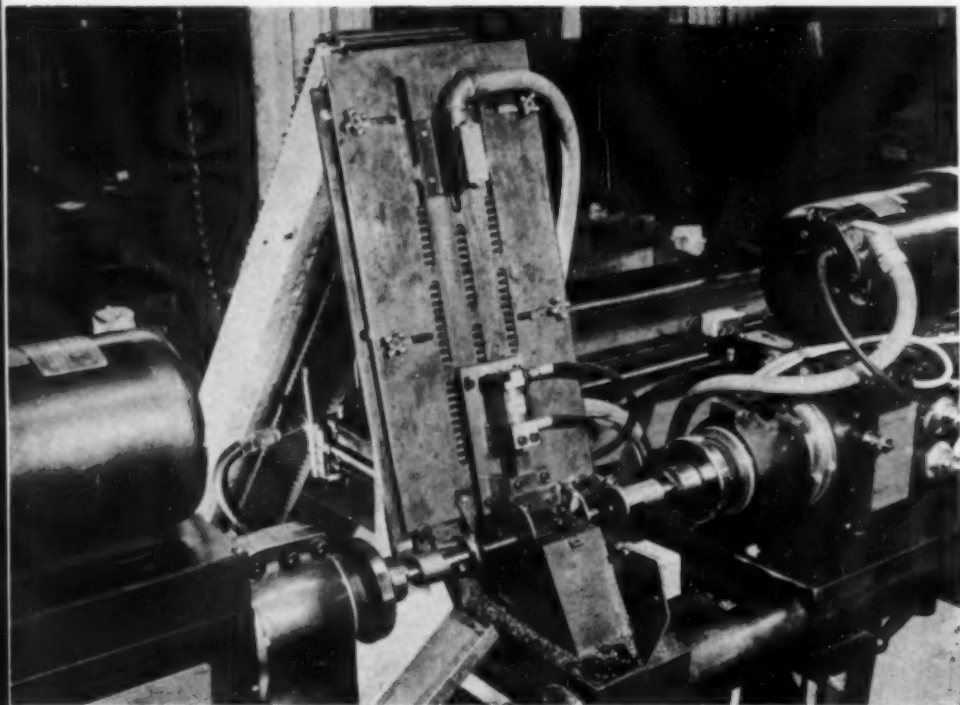


1. BAR STOCK for small Leece-Neville motor shafts is cut to length automatically; the lengths are then fed by means of the inclined conveyor into a magazine that feeds a chamfering machine.

All functions of the chamfering machine are performed automatically, including loading and unloading.

This machine, along with the remainder of the line, can handle shaft production at a high rate, the minimum design speed being 1200 shafts an hour or 20 a minute.

Rough grinding in the first Cincinnati machine removes 0.010" on the O.D. Shafts then feed via a second Federal conveyor to the second grinder which performs the finish grind, removing only 0.002" and bringing shafts to specified final size. Shafts that require a flat then are fed automatically through a milling machine and then



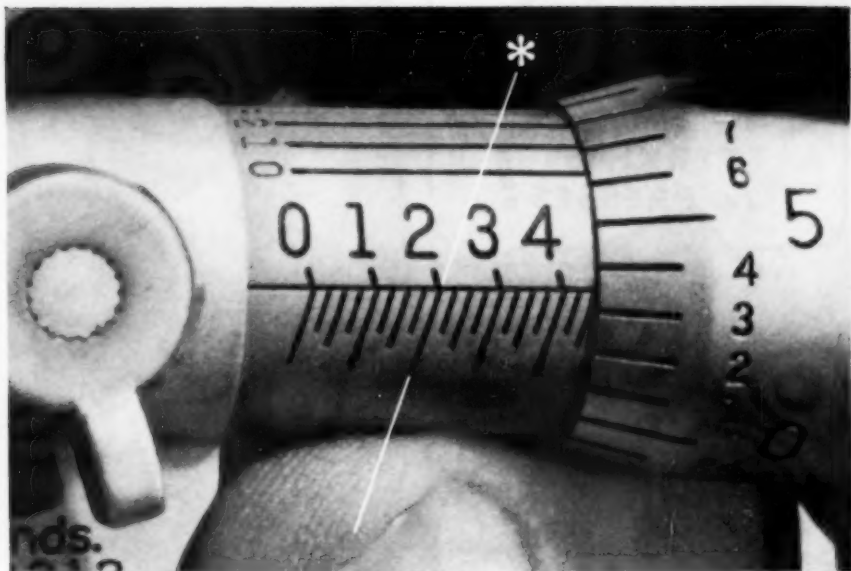
2. CUT-OFF BAR STOCK is chamfered and is then discharged to a conveyor that takes them to a centerless grinder.

AUTOMATED SETUP continued

are passed through a press die that produces serrations parallel to the axis. These serrations are to anchor the rotor laminations that are pressed over the shaft subsequently.

Normally, it requires only three men to operate the entire line-up to and including the centerless grinders, one man being needed to check the machines for proper functioning. It is necessary to do some manual work in loading bars into the hopper that feeds them to the cut-off machine but, as they are handled in bundles, with a hoist, this work requires little time and at infrequent intervals. Total time per shaft is exceedingly small. By making suitable adjustments, shafts of any length from 4" to 12" in length can be produced.

• • •



New B&S No. 1011 Micrometer has slanting barrel graduations - thimble that converts to "friction" or "fixed" type - handy thumb-oper-

ated wrap-around lock - satin finish - easy zero setting - carbide faces - dependable B&S precision. Range: 0-1", in 10-thousandths.

New slant on Brown & Sharpe mikes cuts out 25-thousandth errors!

See the barrel graduations on this new Brown & Sharpe mike? They're *slanted*.

This means they can't hide under the edge of the thimble the way right-angle graduations do.

They eliminate the embarrassing and expensive 25-thousandth errors possible in an ordinary mike when only one-fifth of a turn of the thimble hides the graduation.

Protect your workmanship as well as your eyes! Ask your Brown & Sharpe dealer for the new B&S No. 1011 Micrometer with *slanting* graduations. No charge for personalized initials. Brown & Sharpe Mfg. Co., Providence 1, Rhode Island.



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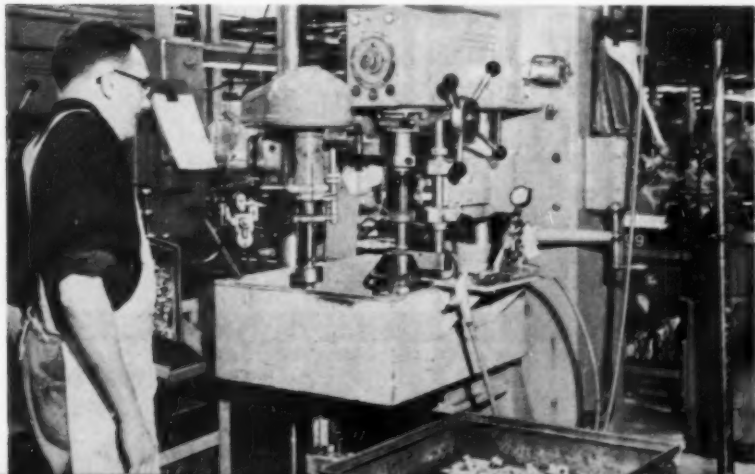
THREADS FLY ON CONNECTORS— DUE TO SPEEDY PRECISION TAPPERS

■ A battery of vertical precision threading and tapping machines at Scintilla Division of The Bendix Corp., Sidney, N.Y., is now turning out over 80,000 precision threads per day, a two-to-one production gain over former methods. Demand for aeronautical electrical connectors, used on missiles and jet aircraft, had been straining the company facilities, with external threading a problem.

The threading process was revamped by installing five Warner & Swasey No. 12 tappers equipped with air-operated spindle return. Each machine also was outfitted with a hand-indexed rotating fixture and a supplementary drill press attached to the edge of the tapper's worktable. This allowed both threading and certain drill press work to be handled simultaneously in a single setup.

The work cycle starts with the operator unloading the finished part and loading a new workpiece into the indexing table. He then indexes the table, which automatically

An air-operated spindle return, a hand-indexed rotating fixture, and a supplementary drill press attached to the worktable of this Warner & Swasey No. 12 precision tapper, combined to give a production gain in threading aircraft connectors.

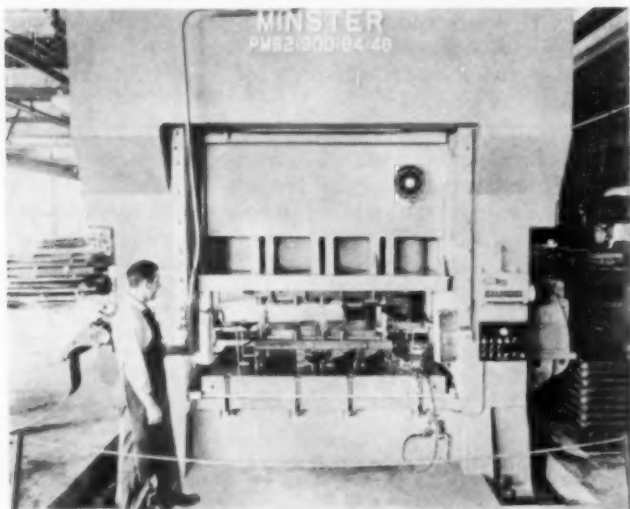


begins the working stroke on both the drill press and the taper. A special cutting head on the drill press makes a chamfer for the thread, breaks sharp corners, and sometimes turns a diameter on the part. At the bottom of the taper's threading stroke, the yoke operated die head snaps open, guide fingers automatically disengage from the lead screw, and the quick

air-return pulls the spindle up ready for a new stroke. The die head then is reset and the guide fingers re-engage the lead screw. This cycle is repeated as many as 500 times per hour.

Operating three shifts per day, the W & S tappers produce precision O.D. aircraft threads ranging from 1/2"-28 to 2-5/16"-16, in aluminum die cast or turned bar stock. • • •

MAGNAVOX CUTS PARTS COST WITH MINSTER PRESS



Minster Progress-O-Matic press in operation running 4 x 8" loudspeaker cone housings progressively at 1800 parts per hour.

■ A press and die modernization program, developed by production engineers at Magnavox Co.'s Paducah, Ky., plant, has resulted in a 50% reduction in the per part cost of manufacturing loudspeaker cone housings. The new production process, with a reported 600% direct labor saving, revolves around a 300 ton Minster Progress-O-Matic two point straight side press equipped with automatic feed equip-

ment and five to seven stage progressive dies.

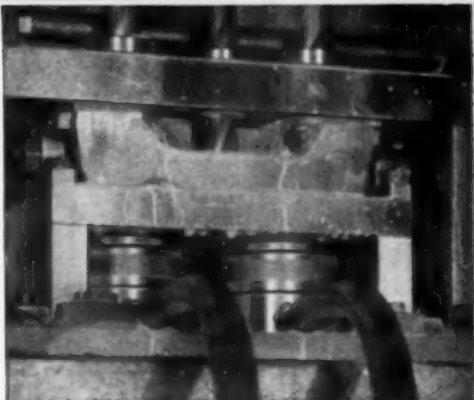
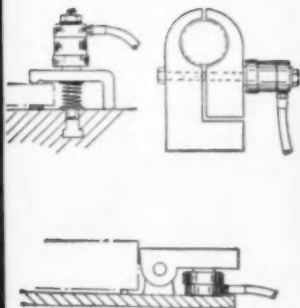
The new Minster press and progressive dies replaced seven old 200 ton straight side presses which were being used for primary and secondary operations with seven individual single stage dies. Seven operators hand fed parts. Production averaged 625 parts per hour.

Cone housings ranging from 3" to

6 x 9" in size are now being automatically and progressively produced from coil stock to finished part in one press, by one operator at an average rate of 1800 finished parts per hour.

The 300 ton double-geared press has an 84" x 48" bed and is equipped with the patented Minster intermediate shaft combination air friction

clutch and brake drive arrangement. This construction makes it possible to attain an exceptional speed range for a double-geared press—25 to 50 strokes per minute. Magnavox can select the most efficient operating speed to meet varied requirements of the different size parts and dies. Other features such as feed design and recirculating oil lubrication effected the selection of the press. • • •



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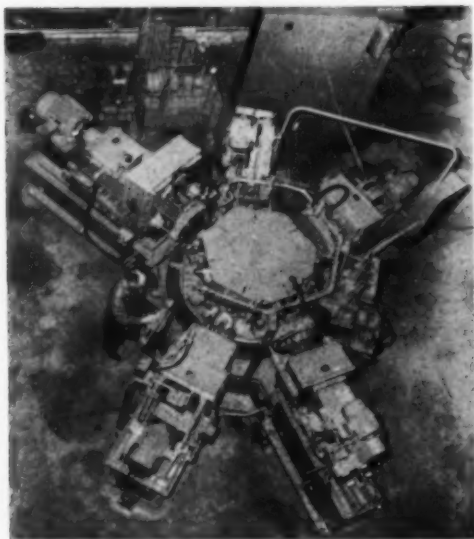
WILTON

WILTON TOOL MFG. CO. INC.
SCHILLER PARK, ILLINOIS

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AUTOMATION IN THE ROUND SAVES TIME AND SPACE



54 drilling, reaming, counterboring, and tapping operations are performed at six machining stations of this machine.

■ A major automobile manufacturer has increased production efficiency with a new carousel-type machine which performs all drilling, reaming, counterboring, and tapping operations on two different flywheels. Core of the machine is a seven-position rotary table surrounded by six machining units and one loading and unloading station.

Each flywheel is fastened vertically against the table side by a precision collet which expands through the center hole in the flywheel. As the table indexes, multiple spindle and single spindle drill units advance and drill 40 holes, ream 14, and counterbore and tap 6. Push button controls enable the operator to select the opera-

tions necessary to machine either of the two flywheels.

National Automatic Tool Co., Inc., in Richmond, Ind., designed and built the machine in circular automation form to simplify the handling problem posed by the workpieces. It accomplishes a remarkable amount of machining in minimum floor space.

Chip removal is automatic—a brush moves with the turntable, sweeping chips before it into an underfloor conveyor. . . .

"Cookie Cutter" Method Used On Steel & Aluminum



C. J. Smith, Aeronautics Division foreman, examines a finished part which was blanked from the steel-rule die held by G. T. Snyder, press operator.

■ Steel-rule dies, a metal blanking process introduced into Chance Vought's sheet metal detail section

this year, have already produced man-hour savings which total more than \$50,000.

The steel-rule die method, which can save as much as 80% on conventional die preparation costs, operates very much like a housewife's "cookie cutter." The Dallas, Texas company's "cookie cutters," however, operate neither on dough nor batter but on manufacturing materials such as steel and aluminum and the new metals, titanium for example, which are incorporated in Crusader fighters.

To illustrate the potential for cutting production costs with the new method, a small titanium panel, one of more than 1,585 parts, produced with steel-rule dies, is blanked and pierced in a single operation rather than the multiple operations formerly required. Using a medium sized piece of titanium for an "average part," a

saving of 20.47 man-minutes per piece was realized by utilizing the new process.

The steel-rule method employs a wood-metal die set, using available special materials and equipment. The punch is flat "steel-rule stock," shaped to the form of the finished product and inserted in a wooden form for support. Also inserted within the area of the steel cutting band as required for holes or unusual openings, are punches. The die itself is of tempered steel, sawed to the exact punch contour and then ground for clearance.

The dies are fitted into a punch press machine which forces the manufacturing "cookie cutter" into the materials scheduled to be blanked at pressures up to 600 tons—depending upon the toughness of the material being processed. . . .

Where GOOD LIGHT COUNTS

UL LISTED

The Vimco light gets in close to the work, where you need it most. A flexible arm of steel allows you to move the lamp to any position without resetting. That's why you find Vimco lights —

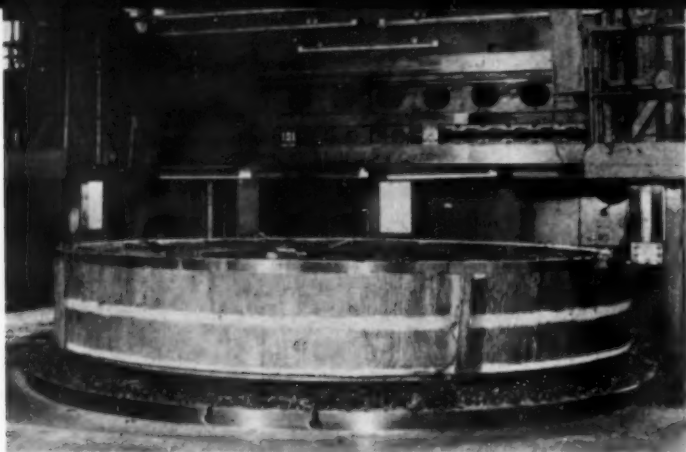
IN THE BEST COMPANY

Pictured at right is the Barker Bench Type Mill, with Vimco light.

VIMCO MFG. CO. INC. • Holland, N. Y.

Circle No. 312 on postpaid card for more information about economical, on-the-job lighting.





One pass will remove nine tons of steel from this 18" diameter casting in 4.8 hours. The rough-turning operation is made with two tools at a metal removal rate of 200 cu. in. per minute.

CLAMPED CARBIDE INSERT TOOLS INCREASE METAL REMOVAL RATE

■ A metal removal rate of 200 cu. in. per minute was achieved recently in rough turning 42-ton steel castings in a midwestern machine shop of a well-known manufacturer. Machining time was reduced 72%, from 17½ hours to less than five hours, and the job of removing nine tons of metal was completed in one pass instead of the formerly required two passes. A change in the type of tooling permitted doubling feed and depth of cut without appreciable change in cutting speed.

The job was rough-turning a 44" face on cast steel split gear rings from a diameter of 220" to 215.8". The rings were machined on a 20' Niles boring mill with two tools—one on each side ram.

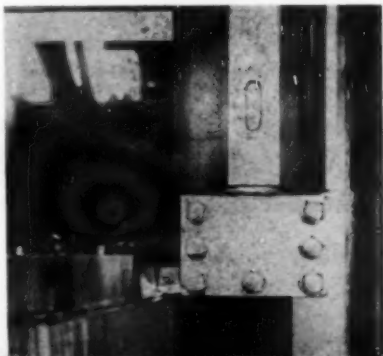
The increase in metal removal rate was made with heavy-duty clamped carbide insert tools made by Kennametal, Inc., Latrobe, Pa. Kennametal Style BRH tools with modified inserts

of Grade K2S replaced another type of carbide insert tools.

Depth of cut was increased from ½" to 1¼" for the first tool and from ½" to 1" for the second tool. Feed was increased from .032" to .060" per revolution. Turning speed was reduced 2% from 150 to 144 sfm. These changes also permitted using the boring mill capacity more fully.

Savings were computed at \$24 per hour for machine burden. With a time saving of 12.7 hours this amounted to \$300 per piece machined. • • •

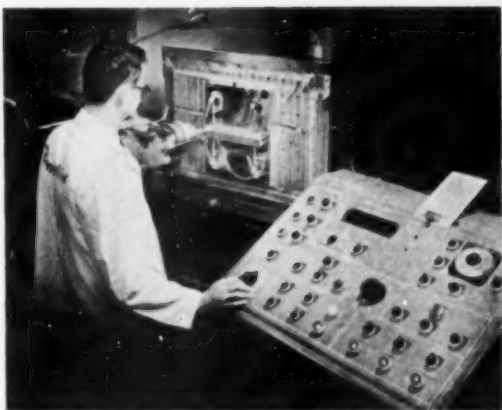
Tools on two side rams of the 20' boring mill each removed 100 cu. in. per minute of steel from a 220" diameter cast steel split gear ring.



Clamps Keep Profiler Competitive On Simple Jobs

■ Using a large Kearney & Trecker, tape-controlled three-axis profiler, the Contract Machining Dept., Industrial Controls Section of The Bendix Corporation (Detroit) has remained competitive on a relatively simple machining job with the aid of quick-acting De-Sta-Co Model 605 plunger-type toggle clamps furnished by Detroit Stamping Co., 350 Midland Ave., Detroit 3, Mich. The clamps are part of a fixture set-up used for machining aluminum alloy mounting brackets.

Two brackets are machined simultaneously. For cutting off the ends and finishing the surfaces, Bendix schedules the operation at a 30-ipm feed and 1260 rpm. This operation requires cutters of two different diameters. The cutters are changed without removing the workpieces.



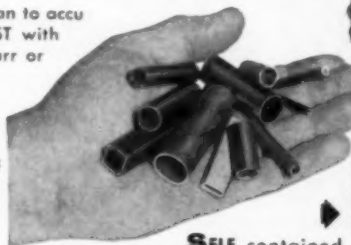
The fixture is made up of four Model 605 clamps mounted on a base. The parts are inserted in a channeled holding block and located against stops. They are then securely locked in the block by the clamps. A fixture plate, perpendicular to the machine table, holds the fixture. . . .

New VOGEL AUTOMATIC CUT-OFF MACHINES

Pneumatic or Hydraulic

Units shear clean to accurate lengths FAST with practically no burr or distortion

SAMPLES were sheared off by new Vogel Automatic Cut-Off Machines.



Phone **FILLMORE 5-0160**, or write to.

SELF contained CUT-OFF unit complete with base cabinet, all necessary switches and controls, ready for operation.

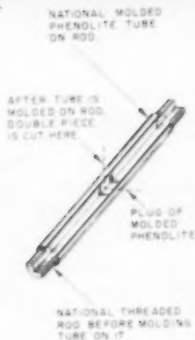


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BEFORE



AFTER

Applying Value Analysis saved \$3,000 a year for General Electric.

G.E.'s Value Analysis Cuts Cost of Brush Holder Stud 74%

■ The aim of General Electric's Value Analysis program is to lower the cost of a product or component without sacrificing quality or performance. Applying Value Analysis to its brush holder stud, G.E. slashed the cost of this part 74% by having it made outside, with a yearly savings of \$3,000.

Formerly, G.E. fabricated the studs from two materials—steel rods and pre-cut phenolic tubes. The tubing, into which the rod was inserted, was allowed to extend $\frac{3}{8}$ " to prevent the stud from making contact with other metal parts. Because of variation between the O.D. of the steel rod and the I.D. of the phenolic tube, a uniformly tight fit was not possible. As a result, G.E. had to cement the tube to the steel bar—a costly operation, averaging \$1.74 per stud.

G.E. then called in National Vulcanized Fibre Co. National recommended molding the tube on the steel stud. Because of National's experience with bonding phenolic plastic to metal, it could produce the brush holder stud at a cost of \$.70 per stud instead of \$1.74.



Brush holder stud shown is used in G.E.'s large electric motors.

National molds the Phenolite tubing on the two steel studs simultaneously. Studs are threaded prior to being encased. During the molding operation, the unthreaded ends of the studs are separated by $\frac{3}{4}$ ". After the Phenolite has been applied, the tube is cut, separating the two studs. National also incorporated a molded Phenolite plug into the tube extension at the unthreaded end of the stud, which feature shields the brush holder stud from electrical contact with other metal parts.

• • •

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*lower
cost*

Hammond

Electrolytic Chip Breaker and Oscillating Cup Wheel Grinder

"2 in 1"
*for Low and
Medium Volume
Tool Grinding*



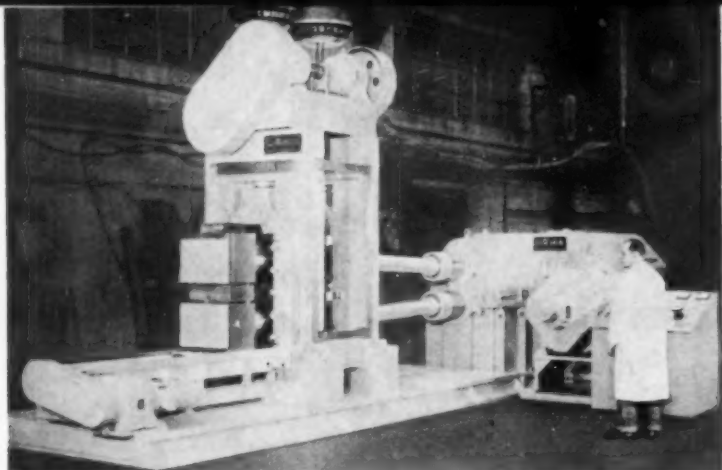
Hammond Machinery Builders INC.

1614 DOUGLAS AVENUE KALAMAZOO, MICHIGAN

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November, 1960

165



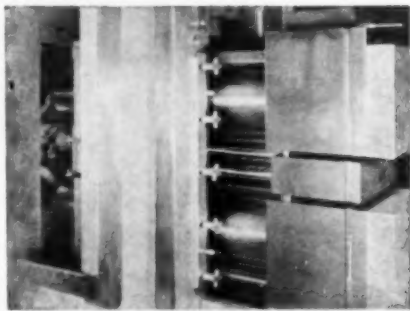
3" and 14" x 20" Loma 2-high/4-high combination rolling mill for remote control operation in glovebox enclosure.

REMOTE CONTROL ROLLING MILL FOR PLUTONIUM ALLOYS

■ An important step in the taming of plutonium for peaceful use was accomplished with the completion of the world's first rolling mill designed to operate entirely by remote control within an air-tight steel enclosure vessel. The mill was designed and built by Loma Machine Manufacturing Co., Inc. of New York for installation at the Hanford Works in Washington which General Electric operates as prime contractor for the U.S. Atomic Energy Commission.

The machine constitutes the major rolling facility serving the Plutonium Recycle Test Reactor and will be used to produce fuel elements in a variety of shapes and configurations.

Since plutonium readily oxidizes in air and there is a danger from spontaneous combustion, it is necessary to process the metal in an inert atmosphere of argon. Hence, the new machine is completely enclosed within a fabricated steel hood or glovebox. All electric motors are mounted on the outside, as it is undesirable to have



Removal of 3" and 14" x 20" 4-high roll set by remote control.

them within the argon-filled hood.

This 20" wide 2-high/4-high combination rolling mill employs 3" dia. work rolls and 14" dia. backup rolls. The power-operated roll change mechanism facilitates removal and replacement of various types of rolls within the glovebox area. The roll change mechanism not only accelerates changeover of rolls from 2-high to 4-high operation, and vice versa, but provides safe, remote control handling of rolls assumed to be con-

taminated. Initially, three roll sets are supplied with the mill.

The entire machine is of exceptionally rugged construction, having a roll separating force capacity of 800,000 lb. at a speed of 100 fpm. The remote control power screwdown system consists of two 5 hp gear-motors offering alternate speeds of $\frac{1}{4}$ " and 4" per minute. A slideway

and slide mechanism is provided for roll changing.

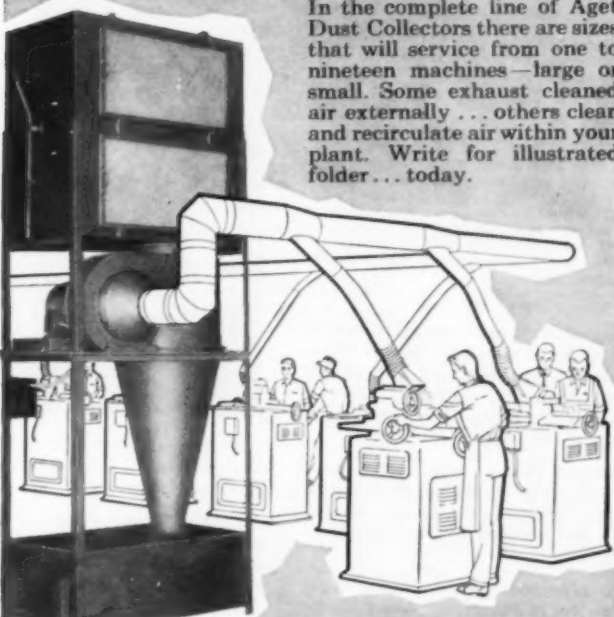
The mill is driven by a 100-hp G-E "Speed Variator" set comprising a DC mill motor, a motor-generator, an operator's console and various control equipment. The drive offers constant horsepower characteristics from 42 to 24 fpm rolling speed and constant torque characteristics from 24 fpm to creeping speed. • • •

just ONE

DUSTKOP
STOPS DUST

heavy duty unit services up to 19 MACHINES

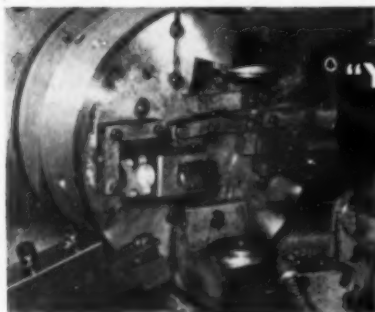
In the complete line of Aglet Dust Collectors there are sizes that will service from one to nineteen machines—large or small. Some exhaust cleaned air externally . . . others clean and recirculate air within your plant. Write for illustrated folder . . . today.



46 Standard Models—Ready to Use

AGET manufacturing company
1402 Church Street • Adrian, Michigan

Orbit Valve, Tulsa, proves it again:



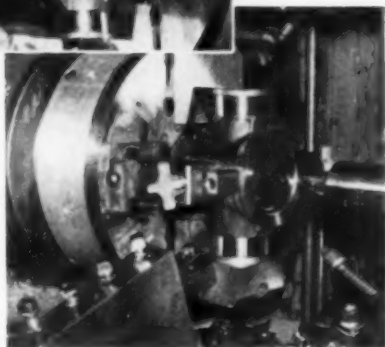
“You make money every time
you chuck with *Buck*”

↑ Shows clever, equalizing fixtures and top jaws developed by Orbit which work in conjunction with the 2 jaws of the Buck power chuck.

Operator places valve in position for machining. Lathe is a 3 AC Warner & Swasey Automatic. ➡



Final operating step: finish reaming. Four ➡ other operations include — rough face of valve body flange, rough drill, and rough bore; rough drill trunnion diameter, rough out bonnet diameter; cut core clearance, finish bonnet diameter; finish trunnion diameter and bottom of trunnion. Trunnion tolerances and concentricity must be within .003”.



The continual plant modernization program of Orbit Valve Co., Tulsa, Oklahoma — pioneer producer of valves for handling petroleum and petrochemicals — resulted recently in saving 18 hours a week on valve body production.

The major change was from hand turret lathe operation to automatics, using the Buck Aluminum body power chuck. It could be done because of the Buck precision capabilities.

Future expected improvements are a 10% increase in production, major time-

savings on a former true-up operation, and consistent quality that will reduce inspection time.

The Buck Ajust-Tru® principle guarantees precision within .001” on automatics, and provides many other distinct advantages. Send for a catalog. See why “It pays to chuck with Buck.”

Makers of Scroll, Power,
Dust Proof, Independent
Chucks.

BUCK TOOL COMPANY

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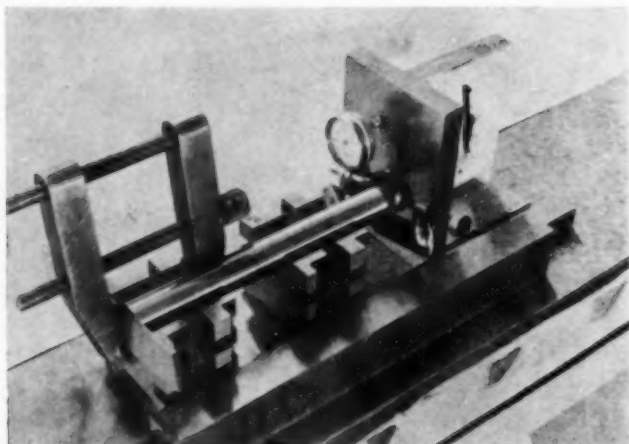
VIBRATION DAMPENER FOR ELECTRIC MOTORS

By **Robert Micals**

■ We use vibration dampeners on all of the electric motors in our shop and have found that by making them ourselves we have cut costs considerably. An ideal heavy duty oil-proof cushion can be made from the rubber mounts used in auto shock absorbers.

Make the brackets as shown from $\frac{1}{8}$ " thick sheet steel and drill a $\frac{7}{8}$ " hole in the center. Cut the bushing $\frac{5}{8}$ " long and fit in the hole. Bolted together with a washer on each end, they can be compressed tightly enough to support a one hp electric motor.

• • •



DIAL CHECKING SQUARENESS OF AN ANGLE PLATE

By H. J. Gerber

■ A simple surface plate set-up, making use of common shop accessories only, will enable you to make a dial indicator testing arrangement for checking the squareness of angle plates.

A precision cylindrical test bar is held in a pair of matched precision "V" blocks. A dial indicator is clamped to the test bar so that it can be used to sweep the face of the angle plate. "V" blocks and angle plate are aligned

with each other by a large precision parallel. End thrust of the test bar is maintained by a smaller parallel clamped across the outer "V" block. It is necessary also that the bearing end of the test bar be ground perfectly square with its cylindrical surface in order to prevent any cam action while it is rotated.

Such a set-up will indicate not only total error of the angle plate but will enable you to locate specific areas of error and the exact amount it is out of true. . . .

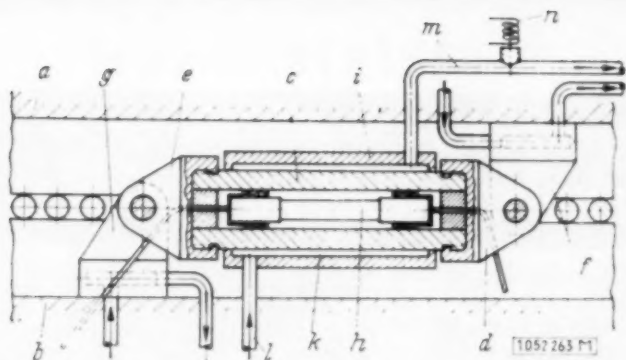
FEEDING BY INCREMENTS

By J. S. Spizig

■ It is very difficult to move a slide only a few ten-thousandths of an inch. This is particularly true of grinders and other precision machines. A few years ago a device was introduced to overcome this problem by magnetostriction. (Compare: "Controlling

Grinding Feeds to Micro-Inches," Machine & Tool Blue Book, April '58, p. 129.)

A similar effect can be obtained when heat or coolant is applied to a metal bar. The feed unit is mounted between the sliding member (a) and the bed (b). In the bore of the bar (c) is the heating installation, e.g. a resistor element (h). When the tem-



perature of the bar is increased, the bar expands in accordance with the coefficient of the thermal expansion of the material used. For instance, the expansion of steel amounts to 6.36 micro-inches per inch, when the temperature is raised for one degree Fahrenheit. Therefore the slide can be moved in very small increments.

To retract the slide back to the original position, the bar is cooled by a stream of coolant through the sleeve around the bar. The valve in the coolant system can be opened by a solenoid (n) tied in with the sequence control. With the drop of the temperature, the bar contracts. Both supports on the pivots are cooled permanently to avoid heat transfer to the other machine components. It is important not to have any backlash in the pivots.

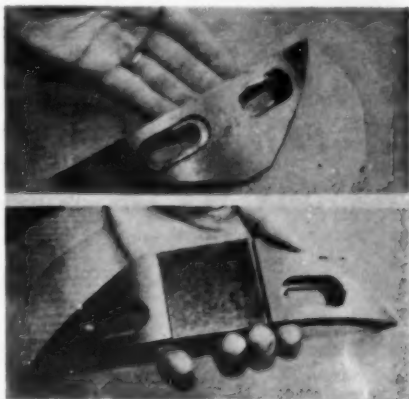
The internal stresses affected by the temperature change are very high. Nevertheless, the minute movements of the control unit can be absorbed by the elasticity of the machine members until the static friction is overwhelmed. The result is the well-known stick-slip effect, if the friction is kept low with anti-friction bearings.

The device is a German patent No. 1 052 263 of Messrs. Fortuna, Stuttgart.

• • •

Revised Rapid Travel Cam Eliminates Jogging

■ The Timken Roller Bearing Co. has revised the rapid travel cam on automatic screw machines at its Bucyrus, Ohio, plant to assure that the collet on each machine is open when the machine is out of stock and



is automatically stopped. In revising, the rapid travel cam was split and a spacer was added. This spacer permits the cam to keep the collet open so the stock butt can be removed. With this revision, the problem of jogging these machines has been eliminated and the operation of restocking the machine has been simplified, requiring only a fraction of the time previously needed.

• • •

For fast, economical cutting of flat metal shapes there are **7 MODELS OF Campbell Nibbling Machines**

...with cutting capacities ranging from 3/32" mild steel for **MODEL 0** machine to 1/2" mild steel for **MODEL 530**, in sheet sizes from 16" or less, to 72".

CAMPBELL NIBBLERS are making tremendous savings in time and money for hundreds of users in aircraft and other metal-working plants.

...in fast cutting of ferrous and non-ferrous sheet metals or composition sheets.

...for moderate production runs or experimental development work.



Economical
"throw-away"
punch and die



Send for this
catalog for complete
information on
this versatile
production and
experimental tool

• **CAMPBELL NIBBLERS** cut from 40 to 60 times faster than drilling or filing. A fast-moving punch (350 to 900 strokes per minute) operating over a die, nibbles out the design, taking a small "bite" with each stroke of the punch.

- ...for any and all kinds of shapes
- ...for either inside or outside cuts
- ...with no distortion of material—no internal strains
—no invisible fractures—no burr
- ...with a "nibbled" edge that is sufficiently smooth
to require very little finishing and sometimes none

CAMPBELL standard punches are made double end to double work life and halve the cost. Prices are so low (starting at 40c each, or 20c per working end) that new punches cost less than regrinding dull ones.

Here is a quick picture of **CAMPBELL NIBBLING MACHINE** Capacities

Campbell Nibbler Model #	Sheet Width	WORKING CAPACITY Sheet Thickness		Strokes per Minute
		Mild Steel	Alloy Steel	
0.....	16"	3/32"	1/16"	900
1A.....	20"	3/16"	1/8"	375-650
430.....	60"	3/8"	1/4"	350-525
436.....	72"	3/8"	1/4"	350-525
530.....	60"	1/2"	5/16"	350-525
2524.....	48"	1/4"	3/16"	375-650
2536.....	72"	1/4"	3/16"	375-650

CAMPBELL NIBBLERS

Wilson Mechanical Instrument Division
AMERICAN CHAIN & CABLE

Dept. 937, 230 Park Avenue, New York 17, N.Y.

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free literature

To receive copies of booklets described below, circle their identifying numbers on an Action Card, found opposite pages 88 and 248.

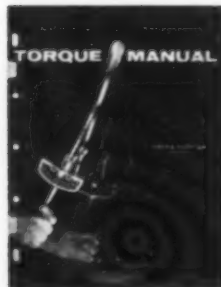
14



(See Number 1)



(See Number 2)



(See Number 3)

1. Drill Jig Bushings. Selection and ordering of each type and size American drill bushing is simplified by using new catalog. New products, shown for the first time, include: Unalok bushing liners, Delt-A-Liners, and the new Multi-Jig, locating jig and round clamp accessories. American Drill Bushing Co., 5107 Pacific, L.A. 58.

2. Honing Catalog No. 200 covers internal, external, and straight line honing. Charts list spindle speeds and coolants for various honing operations. Included are illustrations and specifications for the company's line of honing machines, tools, and abrasives. Barnes Drill Co., 852 Chestnut St., Rockford, Ill.

3. Torque Wrench manual is a third completely revised edition. 31 new pages contain application illustrations, bolt charts, discussions on assembly characteristics, instructions for torque wrench testing, pictures of modified and special torque wrenches, formulas and illustrated explanations for using adapters, attachments, and extensions. P. A. Sturtevant Co., Addison, Ill.

4. Coolant Pump. Illustrated leaflet shows the Mico coolant pump in use on lathe and drill press. Features reported include: completely submersible, needs no air supply, and provides a steady stream of coolant with no reservoir required. Mico Engineering Co., 4400 Penwood Rd., Brentwood, Md.

5. Hardchrome Plating on Ferrous and Non-Ferrous Metals gives the why's and wherefore's of the plating of Hardchromium process. What does the term "hardchrome" mean? What metals can be plated? and What purpose does hardchrome serve? are some of the questions answered. Bulletins 1 through 3 are included; others will be issued. Hardchrome Electro Processing Corp., 10 Vandewater St. at Brooklyn Bridge, New York 38, N.Y.

6. Die Handling, referring here to separating of a die and positioning the components for work thereon, is presented in literature. Various models of die handlers are shown in diversified applications. Harnsford Mfg. Corp., 1239 University Ave., Rochester 7, N.Y.

7. Small-Bore Gage; Tester For Dial Indicators. The Intest high precision small-bore gage has a minimum bore, .057", range, .057"-.808". The Metron tester for dial indicators consists of a test stand, with a micrometer screw for taking correction curves, and a scale and holder for testing measuring pressure. Flyers are available from Skandia Tool Sales, 3507 E. Olympic Blvd., Los Angeles 23.

FREE LITERATURE continued

8. Precision Speed Lathes. Rivett 60 Series features one motion control—single lever starts lathe spindle, selects speeds up to 4800 rpm, changes speed during operation, or instantly stops or reverses spindle. Brochure from Rivett Lathe & Grinder, Inc., Brighton 35, Boston, Mass.

9. Rotary Files, Countersinks, Cutting Tools. Beaver Cut rotary files, chatterless countersinks, and high speed cutting tools are listed with specifications and prices in literature from Beaver Cut Rotary File Co., 400 E. Slauson, L.A. 11.

10. Valve-In-Head Cylinders. Two new models of single acting cylinders feature a three-way solenoid valve built into the rear head. These models are described in flyer from Allenair Corp., 255 E. 2nd St., Mineola, N.Y.

11. Mounting Equipment. Unisorb Mounting System, in a wide variety of densities and thicknesses, is designed to control transmitted vibration and noise. Brochure is available from Unisorb Div., The Felters Co., 210 South St., Boston 11.

12. Layout Drilling Machine. Brochure provides illustrations, descriptive material, and specifications on various models offered. These range from the standard machine, with hand traverse to table and saddle, to the automatic positioning machines and the numerically controlled machines. Cleereman Machine Tool Corp., Green Bay, Wis.

13. Machine Tools and Accessories. Newly revised 52-page catalog describes the complete line of Walker-Turner light-heavyweight machine tools and accessories which includes drill presses, grinders, cut-off machines, band saws, and belt and disc surfacers. Rockwell Mfg. Co., Walker-Turner Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.

14. Color Filling Machines. Domed caps, hubs, shells, spheres, and other die-cast shapes with sunken or raised lettering and design requiring color enamel filling, are easily filled mechanically with the Acropainter as described in Bulletin No. 15-L. The Acromark Co., 15 Morrell St., Elizabeth, N.J.

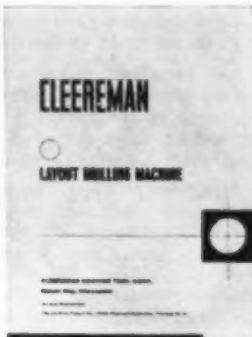
15. Jig Boring Machines. Improved Linley machine, featuring new collet and tool holder design and direct reading micrometer depth gauge, is illustrated and described in brochure. Linley Brothers Co., Bridgeport 1, Conn.

16. "Building Block" Construction. Presented in this new catalog is the latest and most up-to-date information on building block design, standardized components, machine classifications. LaSalle Machine Tool, Inc., 21535 Hoover, Warren, Mich.

17. Automatic Roll Feeds. In this new catalog the complete range of sizes and capacities is described, as well as the many outstanding features of the Durant units. Durant Tool Supply Co., 1-15 Thurbers Ave., Providence 1, R.I.



(See Number 11)



(See Number 12)



(See Number 13)

Complete your shop with this modern metallizing installation



WIRE GUN—Sprays any metal that can be drawn into wire form.



POWDER GUN—Sprays hard-facing alloys and ceramics in powder form.

Without metallizing, no maintenance or "job" shop can offer the same complete service as the shop that uses industry's low-cost "putting-on" tool.

With modern, low-cost metallizing equipment you can spray carbon steels, stainless, babbitts, brass, bronze, nickel, aluminum, tin, zinc, special hard-facing alloys, including tungsten carbide.

■ Save up to 90% of replacement costs on machine repair jobs ■ Do your own hard-facing at high speed, low cost ■ Apply long-wearing, corrosion-resistant coatings

A real opportunity for the smaller shop. Thousands of large, well-known companies and shops have been metallizing users for many years, not only in maintenance work but in production applications on original equipment. Now, with modern low-cost metallizing equipment this high-speed "putting-on" tool is within the reach of even the smallest shop.

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Send off the coupon for detailed information—find out how a metallizing installation can pay for itself in a very short time. No obligation, of course.

METCO INC.

FORMERLY METALLIZING ENGINEERING CO., INC.

Flame Spray Equipment and Supplies



METCO INC.

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Company _____

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FREE LITERATURE continued

18. Automatic Presses. Havir Hi-Production automatic presses are illustrated in catalog, with specifications; and features such as press feeds, frame construction, expanded bed, etc., are included. Line ranges from 5 to 200 tons. Havir Mfg. Co., 444 N. Cleveland, St. Paul 4.

19. Portable Band Saw. The Little Wizard is designed for safety, speed, accuracy, reducing dangerous hand feeding by use of holding devices. Unit cuts wood, rubber, plastic, steel, iron. Complete particulars in brochure from Hack Saw Co., P.O. Box 152, Walworth, Wis.

20. Threading Tools. 44-page Bulletin DT-60 describes the Division's complete threading tool line. Included is the Vers-O-Tool self-opening threading and hollow milling heads, collapsible and solid adjustable taps, as well as the new line of five-chaser Vers-O-Tool heads for revolving and non-revolving spindles. Threading Tools Div., National Acme Co., 170 E. 131 St., Cleveland 8, Ohio.

21. Chucking Turret Lathes. Bulletin 1179-B covers the Gisholt Masterline Fastermatic automatic chucking turret lathes with FeeDial. Lathe uses a new principle for pre-selection of feeds and machine functions. Capacities, speeds and feeds have been increased and controls simplified and centralized. Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.

22. Swaging Machines. Catalog SM-60 contains Fenn's full line of machines, feeding accessories, and other related

equipment. In addition to capacities and dimensions for the nine basic swagers, the catalog gives swaging applications, quality tests for swaging machines, hydroforming, etc. The Fenn Mfg. Co., Fenn Rd., Newington, Conn.

23. Production Lathe. P & W SIM Model T5 lathe, with 10" capacity, has the advantage of fast metal removal, and high accuracy and exceptionally fine finishes. Brochure is available from Pratt & Whitney, W. Hartford 1.

24. Transfer Presses. Eight-page catalog describes in detail the five standard machines in Baird's transfer press line, as well as typical applications involving use of the machines for the high production of stamped and drawn parts. Baird Machine Co., Press Div., 1700 Stratford, Stratford, Conn.

25. "Shipping Container Mounting Systems" describes how engineered protection against shipping/handling damage can be achieved with elastomeric mounting systems custom-designed by Lord Mfg. Co., 1635 W. 12th St., Erie, Pa.

26. Carbide Products. 36-page Price List No. 960 gives specifications and new prices on the firm's complete line of tungsten carbide tools, tool tips, dies, wear parts, and Dex-A-Tools. Adamas Carbide Corp., Kenilworth, N.J.

27. Grinding & Polishing Machines. 27-page brochure presents the line of Hill two-roll vertical abrasive belt grinding and polishing machines. Large fold-out pages illustrate the standard machines. The Hill Acme Co., 1201 W. 65th St., Cleve. 2.



(See Number 20)



(See Number 21)



(See Number 22)

FREE LITERATURE continued

28. O.B.I. Presses. Cleveland's new welded steel line of inclinable power presses is fully detailed in folder OBI-3'60. O.B.I. power presses of 75 to 200 ton capacity are featured. The Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., Cleveland 14, Ohio.

29. Surface Grinder. The Harig 612 grinder has Harig's automatic forced lubrication system, direct drive spindle, and choice of left- or right-hand longitudinal feed features. Harig Manufacturing Corp., 5751 W. Howard, Chicago 48.

30. Color Filling Machines. Dials, covers, name-plates, body shells, foot plates, and other parts can be mechanically enamel color filled with lettering or design in depressed or on raised areas by use of air operated Model 401A Acropainter. Bulletin No. 15-M from The Acromark Co., 15 Morrell St., Elizabeth, N.J.

31. Diamond Impregnated Products. Steel-set process produces a metal bonded diamond tool in which the diamond particles are finely bonded in a sintered steel matrix so that they are not pulled out before their useful life is extended. Illustrated index, diagrams, specifications and prices aid the customer in ordering his drills, reamers, wheels, etc. Fish-Schurman Corp., 70 Portman Rd., New Rochelle, N.Y.

32. Horizontal Boring Machine. Bulletin S-21 describes the design, construction,

and operating features of the new Pope Model 10-6 opposed head precision boring machine, including complete specifications. Pope Machinery Corp., 261 River St., Haverhill, Mass.

33. Fabricator. Eight-page catalog covers features of the single-station sheet metal-working Super 30 machine. Special production-tested accessories are also described. Wales Stripit Inc., Akron, N.Y.

34. Copying Lathe. Typical jobs for the new Conomatic Pilot automatic multi-cycling copying lathe, Model KU, are reported in colorful brochure. Also pointed out are features such as extremely sensitive tracing system, constant and complete control over tool movement, and manual or fully automatic operation at any point in the production cycle. Cone Automatic Machine Co., Inc., Pilot Div., Windsor, Vt.

35. Precision Tools and Instruments. The InteRapid precision dial indicators, from Rolle, Switzerland, are illustrated and diagrammed, with adequate specifications given, in Catalog No. 603. The U.S. importer for the instruments is Borel & Dunner, Inc., Livonia, Mich.

36. "New Approach to Automatic Assembly." Catalog No. 602 features a standard rotary transfer machine which includes parts placing motions at the working area on the dial. Dimensions and design data are given for standard cam actuated work station mechanisms. Ferguson Machine Corp., St. Louis 17.



(See Number 31)



(See Number 32)



(See Number 33)

FREE LITERATURE continued

37. Indexable Insert Milling Cutters. The Wetmore cutters, with solid carbide blades and wedge type construction, precision ground pockets, are diagrammed, with complete specifications. Literature from Wetmore Tool & Engineering Co., 5320 E. Washington Blvd., L.A. 22.

38. Air Hammer and Tools. Bulletin 660 describes the company's improved Air Ace air hammer, which looks like a pistol and fits the hand the same way. Tools for use with the hammer are also shown. Dotmar Industries, Inc., 502 Hanselman Bldg., Kalamazoo, Mich.

39. Belt Grinding Attachment. to fit standard horizontal portable grinders, is presented in two sizes and four models in folder from Jonvir Mfg. Co., 15733 Jas. Couzens Hwy., Detroit 38.

40. Punches and Dies. Catalog MO-6 describes the Series RD (regular duty) unitized tooling for the metal-fabricating industry, for mild steel up to 1/2" thick. Tool Products Corp., 377 Old Falls Blvd., N. Tonawanda, N.Y.

41. Carbide Cutting Tools; Vises. Bulletin MF-360 describes carbide-tipped shell end mills, reamers, core drills, etc., with illustrations and specifications. Included are two models of Wesson universal angle vises. Wesson Co., 1220 Woodward Heights Blvd., Ferndale 20, Mich.

42. Boring, Drilling, Grinding Machines are described in three pieces of literature. One presents a precision boring machine, Model 6, applicable for high production of close tolerance turning, boring, and facing work; another, the Model 6B pre-

cision gun drilling machine featuring spindle speeds up to 15,000 rpm; and a small precision thread grinder, for small-lot production, is described in the third brochure. Jones & Lamson Machine Co., Springfield, Vt.

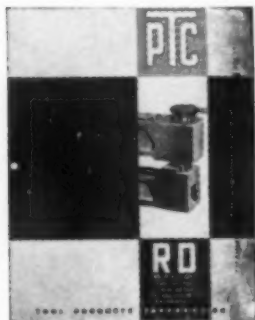
43. Lead Screw Tapper, which taps all sizes of holes with one rugged lead screw, is described in flyer from Thriftmaster Products Corp., 1048 N. Plum St., Lancaster, Pa.

44. Cemented Carbides, designed for wear resistance, are presented in 12-page booklet. Included are details on design techniques, sizes, properties, hardness, etc. Carmet Div., Allegheny Ludlum Steel Corp., Ferndale, Detroit 20.

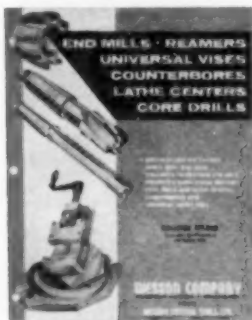
45. Marking Devices. New Method automatic roll markers, whether designed for use in OD or end-face marking, eliminate secondary marking operations. They work as an integral part of the machine. Standard models, custom markers, and secondary marking machines are discussed in booklet from New Method Steel Stamps, Inc., 147 Jos. Campau, Detroit 7.

46. Tips, Tools, Toolholders, Inserts. Catalog TTI-60 includes prices, specifications, and information concerning all Firthite metal cutting products. Featured is the new general purpose steel cutting carbide, Grade NTA. Firth Sterling Inc., 3113 Forbes, Pittsburgh 30.

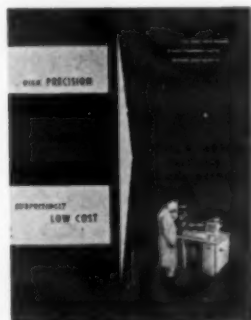
47. Screw Thread Measuring Gages and comparators are presented with illustrations, diagrams, specifications, and prices in brochure. These Scherr-Tumico O-Vee products are available from Tubular Micrometer Co., St. James, Minn.



(See Number 40)



(See Number 41)



(See Number 42)

48. Oscillating Motors. The Roto-Tork line of high-efficiency pneumatic or hydraulic oscillating motors, with instant full torque, is described as to advantages and specifications in literature from Roto-Tork Mfg. Co., 23919 Little Mack, St. Clair Shores, Mich.

49. Portable Air Tools. New catalog entitled "Master Power Portable Air Tools For Screwdriving and Nutsetting" is a complete tool-selection manual concentrating on torque ranges from 2 in.lb. to 160 in.lb. Master Power Corp., 6225 Cochran Rd., Solon 39, Ohio.

50. Gages for Angle Measurement. These include angle gage blocks and optical polygons, featuring 1/4-second accuracies. Catalog is available from Webber Gage Co., 12900 Triskett Rd., Cleveland 11.



(See Number 51)



(See Number 52)

51. Cutting Fluids. Pocket-size folder describes Tapmatic's Dual Action fluids, which simultaneously refrigerate and lubricate. No. 1 is recommended for all metals except aluminum; No. 2, for aluminum. The Fluid-Miser, hand or foot operated, meters cutting fluid speedily. Tapmatic Corp., 845 W. 16th St., Costa Mesa, Calif.

52. Surface Grinder. Bulletin No. 35B60 describes the No. 35B 8" x 24" hydraulic surface grinder which features added capacity under the wheel at no extra cost. Maximum distance between a full 12" dia. wheel and table working surface is now 18 1/2" instead of 12". Covell Mfg. Co., Benton Harbor, Mich.

53. Boring and Reaming Tools. Information supplement featuring illustrations, diagrams, and detailed instructions on use of adjustable boring and reaming tools is available from Muskegon Tool Ind., 11th at Western, Muskegon, Mich.

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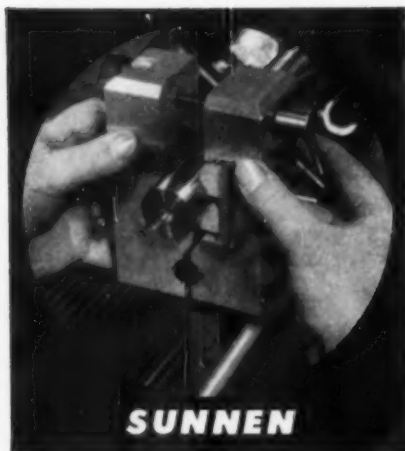
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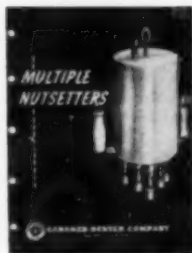
7922 Manchester Ave. • St. Louis 17, Mo.
Canadian Factory: Chatham, Ontario

FREE LITERATURE continued

54. Masonry Coating. Hydrocide Colorcoat is described in 8-page brochure as a heavy bodied, water repellent coating which imparts a beautiful textured finish. Samples of coating included. Building Products Div., Sonneborn Chemical and Refining Corp., Dept. H., 404 Park Ave. S., New York, N.Y.

55. Gusher Tank Units are designed for supplying coolant to machine tools not equipped with a coolant pump. They are illustrated, diagrammed, with specifications included in folder offered by The Ruthman Machinery Co., 1809 Reading Rd., Cincinnati 2, Ohio.

56. Multiple Spindles for production nut setting are available in a wide selection. Power units meet torque requirements to over 200 ft. lb. Literature from Gardner-Denver Co., Quincy, Ill.



(See Number 56)



(See Number 57)

57. Machine Tool Catalogs feature erector type machine tools. Catalog 160 illustrates, in 16 pages, all styles and specifications of machining heads. Catalog 260 contains 28 pages of complete information on feed tables and machine beds. Master Mfg. Co., Inc., 1319 East Avenue A., Hutchinson, Kan.

58. Speed Drives. 16-page Bulletin GEA-6806 describes the new $\frac{1}{4}$ -25 hp line of Polydyne mechanical adjustable speed drives introduced by General Electric, Schenectady 5, N.Y.

59. Gages. 40-page catalog, which illustrates, describes, and prices the complete line of Cadillac gages, is obtainable from Cadillac Gage Co., P.O. Box 3806, Detroit 5, Mich.

60. "Along Carr Lane" is the title of a newsletter being published by Carr Lane Mfg. Co., 4200 Krause Court, St. Louis 19, Mo. The first edition, October, 1960, relates the strides Carr Lane has made in the component field, and lists a few of the more than 125 jig and fixture components available from the company.

61. Chucks. Bulletin No. 800 describes the Cushman power and manually operated two-jaw indexing chucks. Photographs of applications and cross sectional drawings are provided. The Cushman Chuck Co., Hartford 2, Conn.

62. 100th Anniversary Kraeuter Catalog. 24-page Catalog 100 contains information and illustrations on the firm's full line of quality pliers, snips, and other hand tools. Kraeuter & Co., Inc., 585 18th Ave., Newark 3, N.J.

63. Boring, Milling, Grinding Machines. 12-page booklet SJ-106-9-60 points out features of the Spiramatic Jigmils and Micropoint tool grinder, as well as advantages of a new direct-dial dimension system, called Diatrol, and the numerical tape control system referred to as Tapac. DeVlieg Machine Co., Fair St., Royal Oak, Mich.



(See Number 63)



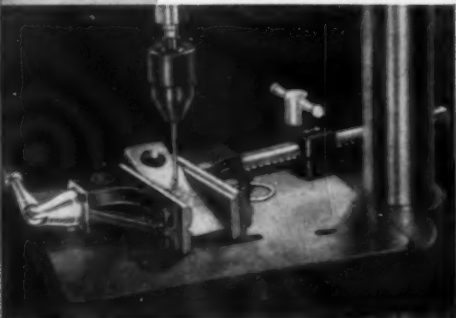
(See Number 64)

64. Grinding and Drilling Equipment. Portable, precision grinding tools and small hole drilling equipment are contained in 36-page catalog. Included are specifications, sizes, capacities, and suggested applications for tool post grinders, flexible shaft tools, quills, Micro-Drills, etc. The Dumore Co., 1300 17th St., Racine, Wis.

65. Chipless Machining, the Roto-Flo process, for cold-forming splines, serrations, grooves, threads, and similar forms, is described and illustrated in eight-page Bulletin RF-60. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12.

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AUTOMATIC KEYLESS CHUCK

Lets you change tools *in seconds* without stopping the spindle. One chuck does the work of several spindles, won't chew up tool shanks. The greater the torque, the tighter the grip.

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Chipless Machining

(By Charles H. Wick. 502 pages; 326 illustrations. \$10.00.)

This new technical how-to volume concerns itself with the chipless machining process—shaping metal parts without the production of chips. It deals with the cold forming of steel by such processes as extrusion, radial forging, spline rolling, power spinning, and explosive forming.

Described and illustrated in detail in the text are the newer methods of cold forming; pertinent data on economies resulting from savings in time and materials; specific product design data and methods information of each process, and the range of various processes, their advantages and limitations, and their typical applications.

This basic, practical guide is an important addition to a technical library because it brings together hitherto unavailable information about these newer processes in one convenient, useful text. Top management, design engineers, process planners, tool engineers, production men, and purchasing executives—all will find the book a valuable reference guide.

(For the convenience of the reader, copies may be ordered directly from **The Book Shelf**, Hitchcock Publishing Co., Wheaton, Ill.)

American Standard Milling Cutters, Nomenclature, Principal Dimensions

(Available from American Standards Association, Dept. PR 172, 10 E. 40th St., New York 16, or the publisher, The American Society of Mechanical Engineers, 29 W. 39th St., New York 18. \$3.00)

This standard, B5.3-1960, has been approved by the American Standards Association and published by The American Society of Mechanical Engineers. It is a revision and unification of two American Standards—B5.3-1950 and B5c1-1947 (**Nomenclature for Milling Cutter Teeth**). The most important changes are:

(1) Deletion of obsolete cutters; (2) inclusion of a nomenclature section made up of terminology taken from B5c1-1947 and B5.3-1950, and (3) segregation and sectionalizing of tolerances on milling cutter dimensions and the addition, for the first time, of a table

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of ferrous and non-ferrous metals...
and non-metallic
materials...

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











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of tolerances on the axial and radial runoff of standard cutters.

All revisions or additions to the previous issue of this standard have been box-outlined for convenience and clarity.

Work to accomplish this latest revision of the standard was initiated through ASA procedures in 1956 by the reactivation of technical committee 5 of the B5 sectional committee concerned with standards for small tools and machine tool elements. The sponsors of the project are the American Society of Tool and Manufacturing Engineers, Metal Cutting Tool Institute, Society of Automotive Engineers, National Machine Tool Builders' Association, and the American Society of Mechanical Engineers. Twelve industrial firms and one federal agency were represented on the committee which developed the standard.

**Dimension Identification Code
For Fluid Power Cylinders**

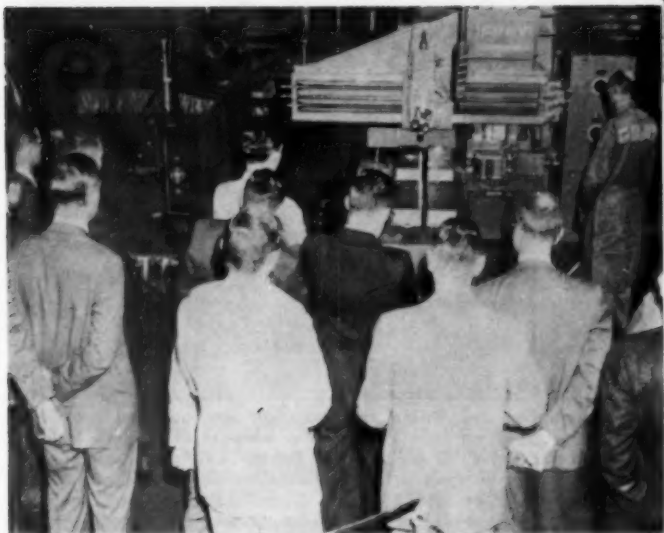
(Published by National Fluid Power Association, 5595 N. Hollywood Ave., Milwaukee 17, Wis. \$1.00. Quantity discounts)

The Board of Directors of the National Fluid Power Association has approved the publication of this recently completed Dimension Identification Code, prepared under the direction of the Cylinder Section of its Technical Board after 17 revisions extending over seven years of study. This publication comprises recommended standards for the location of base points and dimensions of fluid power cylinder diagrams, and a code of letters for designating the dimensions. The recommendations cover the various types of mountings, and can be applied to all cylinders regardless of type of construction.

Don't forget to vote!

news of the industry

16



G. A. Gray Co. representatives watch a demonstration of the compact Flying Scot planer at a premier showing of the new planer held recently at the Gray plant in Cincinnati. The economical planer is Gray's answer to foreign competition.

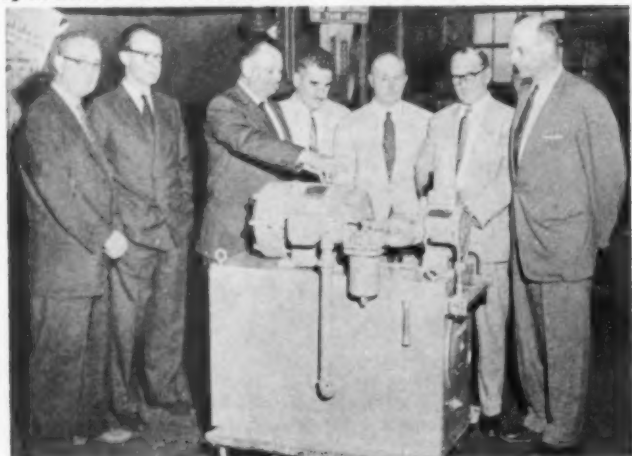
AMERICAN MACHINE TOOL BUILDER MEETS FOREIGN COMPETITION

So as to compete effectively with imported foreign machine tools, U.S. manufacturers are forced to produce better machines and at less cost to the buyer than the foreign imports. In accomplishing this, American makers are attaching new value and importance to ingenuity in the design, engineering, and production of machine tools.

Such an ingenious machine tool manufacturer is the G. A. Gray Co. of Cincinnati. For many years Gray has been a world-wide leader in the manufacture of giant planers, horizontal boring mills, and planer type milling machines. Recently the firm introduced the Flying Scot, a new, low-priced, compact, heavy-duty planer designed for fast carbide planing. It has the high quality features of other Gray machine tools, yet sells for only \$30,660. The machine is ideal for all small planer needs, and its availability puts it on a competitive footing with foreign-made planers.

The planer features double or single cutting heads, and is available in nine combinations of table widths and heights. Basic sizes are 30", 36", and 42".

Racine Hydraulics Held Fifth Technical Conference



Vickers-Armstrongs and Racine Hydraulics officials gathered around a Racine pump are (from left): Wilson Cole, manager of Racine's Simplex Division at Zanesville, Ohio; John S. Brunton, Jr., sales manager of Vickers-Armstrongs (Engineers) Ltd. in London office; T. E. Raymond, Jr. Simplex Division plant superintendent; J. McKissack, technical manager of V-A's Weymouth works; F. A. E. Pritchard, general manager, Weymouth works; John Leigh, manager of northern sales area for V-A at Elswick works, and Gordon Fuller, manager of Racine's International Department.

Racine Hydraulics & Machinery, Inc., producer of hydraulic components, held its fifth technical conference August 28-31. More than 100 sales representatives attended to discuss new products and processes and meet new administrative people.

The Racine, Wis. firm proudly showed its new 8,000 sq.ft. research and development facility, being completed at a cost of over \$500,000. Guests were interested in new equipment such as the new test analyzer which acts like a telephone switchboard, permitting simultaneous tests of multiple circuits. Demonstration was given of the first complete 10,000 psi four-way directional control valve in a self-contained unit.

Very large hydraulic equipment has been added to Racine's line through a cross-licensing arrangement with Vickers-Armstrongs (Engineers) Ltd. of Britain, and acquisition of a new subsidiary, Sarasota Precision Products,



Racine Hydraulics new 8,000 sq. ft. research and development building, offices and labs.

Inc., makers of miniature valves and hydraulic components.

Over 200,000 Attended Machine Tool Exposition Daily

Daily attendance figures added up to a total of over 200,000 for the Machine Tool Exposition, which closed Sept. 16 after a ten-day "run" at the International Amphitheatre. This attendance, largely of top metalworking executives, plant managers and machinery distributors, established an impressive total for such industrial shows, it was pointed out by Alan C. Mattison, president of the National Machine Tool Builders' Association and of his own company, Mattison Machine Works, Rockford, Ill.

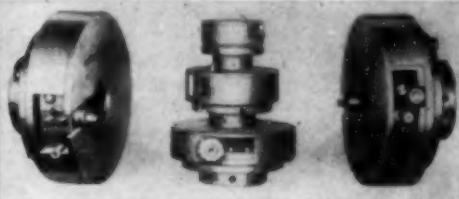
"They were men interested in specific operations and anxious to see how new machine tools could perform them faster, cheaper and better," Mattison added. "As a consequence, the modernization stimulus of the Exposition will be felt for years to come."

"When these men who are from

plants all over the world left the Exposition," Mattison said, "they had a much better idea of how downright obsolete many of the machine tools in their own plants really are. The result, we are confident, will be the inauguration of long-term replacement programs which are absolutely essential if America is to retain its leadership among nations. These steps toward modernization will mean considerable new business for the machine tool industry in the months ahead."

Disassembly of the Exposition started immediately after the closing hour. The better part of a month was required to crate and load the more than 1000 machines—some of them weighing 50 to 75 tons—for shipment. It required 1,163 trucks and 45 railroad cars to bring these machines to the International Amphitheatre. The total weight of all machine tools displayed was 7,250 tons; their value well over \$25,000,000.

MUMMERT-DIXON FACING HEADS



**IMPROVE
FACING OPERATIONS
On Boring Mills,
Drills, Lathes, Millers
And Radials**

One-way and two-way automatic tool feed. Bit travels radially from center outward or reverse. 10 sizes, 6" to 46" dia. Also combination hydraulic Boring and Facing Heads, and "Bulldog" Boring Heads.



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Self-Contained Gear-Driven Radial Grinders

Swing Frame Grinders

Oil Stone Grinders

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C.I.T. Forms New Industrial Leasing Company

Pin-pointing machine tool areas on the map are executives of C.I.T. Corp. as they announced formation of M. & E. Leasing Corp., which will purchase and rent machine tools and other production equipment. Thomas E. Lenihan (left) president, and Richard S. Murphy, vice president, revealed details at the Machine Tool Exposition in Chicago. The two above-named firms are subsidiaries of C.I.T. Financial Corp., New York City.



Chrysler Exec Sees Need of Tax Depreciation Reform

Federal tax depreciation reform that realistically recognizes technological progress and changing price levels is needed quickly to strengthen the country for the international competitive struggle of the 1960's, said Frank V. Olds, assistant comptroller of Chrysler Corporation. Speaking before the Michigan state convention of the Independent Accountants Association, Olds underscored the need for legislative action on tax policies dealing with depreciation of machinery and equipment.

"Our federal government should move quickly to strengthen the country—through depreciation tax reform—for the international competitive struggle of the 1960's. It should move toward the goal of allowing business sufficient deductions before taxes to replace its worn-out or non-competitive equipment at today's cost—not at what it cost fifteen or twenty years ago under completely different conditions.

"In drawing up and enforcing tax legislation governing depreciation the government still tends to think pri-

marily about the length of time it takes to tire out a piece of iron, and not about the ever-shorter length of time it takes a competitor—domestic or foreign—to make today's equipment hopelessly inadequate," he added.

"In the long run, a satisfactory solution to the depreciation problem can be obtained only by the adoption of some method of price-level depreciation," Olds said. The minimum purpose of a depreciation program, he further noted, is to provide replacement funds sufficient to replace assets of a business.

Tool Show Triggered New Orders For W. & S. Co.

The Warner and Swasey Co., Cleveland, received more new orders for machine tools in September than in the previous four-and-a-half months, Walter K. Bailey, president of the company, told members of the New York Society of Security Analysts at its Sept. 30 meeting.

The influx of orders, Bailey said, was triggered by the Machine Tool

Exposition held in Chicago, September 6 to 16th. "In my opinion," he stated, "the Exposition was timed to coincide with the regaining of confidence by business. I am quite bullish about the machine tool industry's market over the next year or two, and very bullish for machines, such as ours, that will produce radical reductions in cost."

Bailey described the Exposition as "an unqualified success." It was particularly notable, he said, for the breadth and depth of new design, with emphasis upon numerically controlled machines. The Warner and Swasey display had 23 machines in operation, 19 of which were of completely new design since 1954.

30,000th Missile Produced By Hughes Aircraft



A sleek, deadly Nuclear Falcon was the 30,000th air-to-air missile to come off the assembly line at the Hughes Aircraft Company's Tucson, Ariz., plant. Falcons produced at the Tucson plant during the past six years now stand guard throughout the Free World with USAF Air Defense Command all-weather interceptor squadrons. Taking delivery of the 30,000th bird from John W. Black, manager of the Hughes Tucson facility, was Lt. Col. George E. Scott, Air Force plant representative.

November, 1960

DORMAN

automatic reverse

TAPPERS

convert any drill press
to tapping



IMMEDIATE DELIVERY!

priced from \$65

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- Adapts to external threading
- Taps most metals and materials
- Takes wide range of taps
- Easy to tap...no skill required
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Bulletin FREE for the asking!

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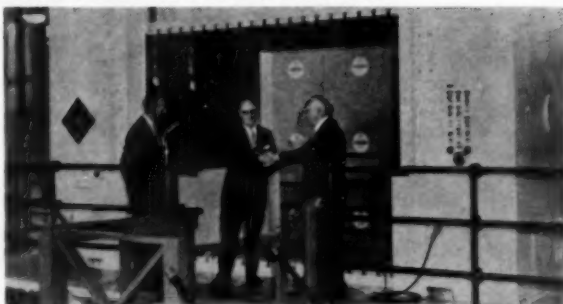
Also headquarters for Adj. & Fixed Center Drillheads
Subsidiary of Thomson Industries, Inc. makers of
BALL BUSHINGS, NYLINED Bearings, 60 Case Shifting

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Clearing Delivers 15,000th Press to Ford Motor Co.

An open house celebration for all employees and their families marked the delivery of the 15,000th press by Clearing, Division of U.S. Industries, Inc., Chicago. To mark this occasion, over 4,000 people visited and toured the facilities at Clearing.

John R. Bartizal, president of Clearing, presented a plaque to Ford Motor Co., purchaser of the 15,000th press. Accepting the plaque on behalf of Ford Motor Company was Frank J. Bushroe, plant manager, Chicago Stamping Plant, Metal Stamping Div.



From left to right: Henry M. Crossen, vice president-manufacturing, Clearing; Frank J. Bushroe, plant manager, Chicago Stamping Plant-Ford Motor Co.; J. R. Bartizal, pres., Clearing.

The 15,000th press manufactured at Clearing, since its founding in 1933, is of bottom drive construction and has a capacity of exerting 800 tons. Total weight is 325,000 lbs.

National Broach Forms Associate Company in England

Formation of an associate company in England to manufacture, sell, and service Red Ring gear production equipment, super precision ball screws, and precision boring heads to British, European, and world markets is announced by National Broach & Machine Co., Detroit.

The new company, located at Coventry, England, is named Precision Gear Machines & Tools Ltd. This company was formed because of the cancellation and termination of all previous licensing arrangements in England. It will be operated independently, with George E. K. Blythe serving as managing director.

World's Largest Generated Diameter Commercial Gears

Farrel-Birmingham Co., Inc., Buffalo, N.Y., has produced what are reportedly

the world's largest generated single helical split ring gears. Four of these gears are being manufactured for Allis Chalmers Manufacturing Co. and will



be installed in a prominent southeastern cement producing plant.

These alloy cast steel gears have a

diameter of 23' with a 30" face width. The finish weight is approximately 85,000 lb. The gears were cut on a large Farrel 12C gear generator which the company designs and manufactures for producing gears of this type. Although this is the largest gear yet produced at the Buffalo plant, present manufacturing facilities will accommodate gears with diameters of from 1" to 27'.

Specialty Steel Purchases Hovis Screwlock Co.

Hovis Screwlock Co. of Warren, Mich., manufacturers of interchangeable punches, bottom dies and compounding blanking dies, has been acquired through outright purchase by Specialty Steel Products, Inc., Pittsburgh, Pa.

An independent operation for 30 years, the company now becomes a division of Specialty Steel Products, Inc. Richard Koch, who has been serving as vice president, is named president of the new division. Leo Rochez is Specialty's president.



"This is only my hobby. I'm really an Arthur Murray dance teacher who smokes a thinking man's cigarette."

LOW COST WAY TO CUT GRINDING COSTS



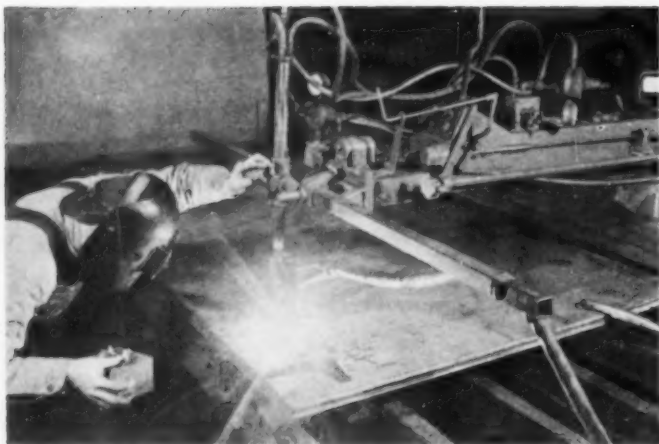
When you dress grinding wheels regularly you clean loaded pores, uncover fresh abrasive grains — GET NEW PERFORMANCE AGAIN AND AGAIN. Dressing makes every wheel more efficient. In the complete Desmond line there is a dresser to meet your requirement—at low cost. A typical Desmond-Huntington dresser® costs less than \$3.00; replaceable cutter sets average 36c. Ask your Desmond distributor's advice.

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grinding wheel dressers and cutters*

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Desmond-Stephan Mfg. Co.
Urbana, Ohio

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Stainless steel as delivered by this process can be finish-machined and welded without rough grinding or similar preparation of the cut edges.

Ryerson Installs Arc-Cutting At Its Aluminum Service Centers

After exhaustive testing and perfection of techniques, **Joseph T. Ryerson & Son, Inc.**, Chicago, has completed installation of Heliarc (tungsten-arc) stainless plate cutting equipment at four of its steel and aluminum service centers. Cost-saving advantages of stainless rings, circles and irregular shapes cut from plate by this method are available to Ryerson customers nationwide.

Tungsten-arc cutting almost completely eliminates carbide precipitation because the electric cutting arc at 28,000° F is shielded and constricted by a cylindrical sheath of argon-hydrogen gas. Since no powder is used, this source of contamination is completely eliminated. The stainless steel can be finish-machined and welded without rough grinding or similar preparation of the cut edges. In many cases, no further processing at all is required. The company can now supply shapes cut from stainless plates up to 2½" thick. The new equipment supplements the firm's facilities for supplying both simple and intricate shapes flame-cut from stainless and carbon steel.

Star Cutter Purchases Baker Keyseaters & Grinders

Star Cutter Co. of Farmington, Mich., has purchased the Baker line of keyseaters, profile grinders, and keyseater cutters from **Baker Brothers, Inc.** of Toledo, Ohio. The purchase includes all machine part stocks, cutter stocks, cutter bar stocks, machines in-process, and all patterns, jigs, fixtures, and special tooling for producing the machine tools.

According to Norman L. Lawton, Star Cutter Co. president, the acquisition of the line was made in accordance with company plans to expand its activities in the machine tool field. Within the past six months, the Star plant facilities have been expanded 50% to provide a total of 50,000 sq.ft. of floor space, Lawton explained.

Moving to Large Quarters, Tri-Seco Stocks Atrax Line

Tri-Seco, Inc., distributors, has moved to new and larger quarters at 9 West Prospect Ave., Mt. Vernon, N.Y. As a result of the move, Tri-Seco will stock, for speedy distribution, the complete line of Atrax solid carbide tools including boring tools, burs, drills, end mills, grinding tools, and reamers for The Atrax Co., Newington, Conn.

Pratt & Whitney To Market Italian & Japanese Machines

Simultaneously with the opening of the National Machine Tool Builders' Exposition in Chicago, Jacob J. Jaeger, president of Pratt & Whitney Co., Inc., announced a triple arrangement involving not only three nations and languages, but three continents as well. The companies involved are Pratt & Whitney Co., Inc., Innocenti S.G. of Milan, and Mitsubishi Zosen Kabushiki Kaisha (Mitsubishi Ship Building & Engineering Co., Ltd.) of Tokyo.

Through the arrangement the West Hartford, Conn. firm will distribute the smaller models of the CWB designed milling, boring, and combined machines manufactured by Mitsubishi in Japan under license from Innocenti. Through a simultaneous arrangement with Innocenti, P & W will also distribute the larger boring mills made in Milan by Innocenti.

Mr. Jaeger pointed out that these are the latest steps in the world-wide mar-

keting program which the company began to formulate about a year ago in consonance with a similar program being developed by its parent corporation, Fairbanks Whitney Corp.

New Carbide Cutting Tool Firm

Carbitool, Inc., subsidiary of Futurmill, Inc., Pontiac, Mich., opened offices and manufacturing facilities at 22221 Dequindre, Hazel Park, Mich. Ernest C. Lewis, recently with Grawell Co., has 16 years' experience in carbide tool development. He will be in charge of sales and general administration. Lawrence J. Heartwell, vice president, also from Grawell, has had 20 years' experience in carbide tool manufacturing. Heartwell will be in charge of manufacturing and product development.

Solid carbide cutting tools to be manufactured include reamers, drills, end mills, burrs, etc., as well as special cutting tools. A special "rush tool service" will be offered.

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Whatever your need for product marking may be, Hoggson stamps can meet it. They are made of finest alloy steel, heat-treated to stand continuous impact without breaking face or mushrooming body. Ask about our inspectors' symbol marking hammers, type holders, hand stamps with locating or positioning attachments, marking dies for hand and machine use.

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more economically

...more efficiently,

with controlled surface finish.

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If you use gun drills... it'll pay to find out how ELDORADO can cut your costs. Chances are, there's an ELDORADO GUN DRILL in stock for you.

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Sizes	$\frac{1}{8}$ " to $\frac{1}{2}$ " dia. in 64ths	$\frac{1}{2}$ " to $\frac{3}{4}$ " dia. in 32nds
OA Lengths	10", 16", 22", 36"	16", 22", 36"
Drivers	.750" dia. x 2 $\frac{1}{8}$ " long	1" x 2 $\frac{1}{4}$ " long
Tips	Carbide	Carbide

MADE TO YOUR SPECIFICATIONS

Sizes	.1250" to 2" dia.
OA Lengths	4" to 120" with dia. limits
Drivers	To fit your need
Tips	Carbide



(*) Trade Mark

Specializing 100% in Gun Drills and Related Tools.

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New Ownership of Metal Cutting Tools Inc.

Announcement has been made of a change in ownership of Metal Cutting Tools Inc., Rockford, Ill. Full interests in this firm have been purchased by William W. Barton and Bruce G. Miller. Barton becomes chairman of the board; Miller, president, and W. Forbes Barton, secretary-treasurer. Previous ownership was held by W. F. and John Barnes Co., a Rockford, Ill. machine tool builder.

The company is one of the leading producers of cutting tools with international distribution, and production will be continued at the present factory, 301 South Water St., Rockford, Ill. No changes in products, policies or personnel will be made.

Executive duties will remain with Bruce G. Miller, president; Raphael Ambrose, sales manager; Edwin Walker, chief engineer, and S. Arthur Getts, superintendent.

Automotive Tool & Die Mfrs. Named Detroit Tooling Assn.

Automotive Tool & Die Manufacturers Association, which was founded in 1933, has been renamed "Detroit Tooling Association." The Association is made up of 160 well-known manufacturers of dies, jigs, fixtures, molds, gages, tools, special machinery, and related products, and suppliers of die tryout, machining, experimental, and designing services.

While original members of the Association were primarily manufacturers of tools and dies for the automotive industry, their clients now represent a wide variety of industries throughout the world, and the scope of their products and services is much broader.

Detroit Tooling Association has been selected as the new name because all of the member companies are located within the greater Detroit area. Collectively, they are reported to form the "Largest Tool, Die, and Special Machine Shop in the World."

ACCURACY



... to millionths of an inch

Accuracy that's a must for tool rooms . . . so fine it can be measured only by a light bounce, so precise it produces micro-inch finishes at production speeds. This is the accuracy you get in the No. 560 Grand Rapids Precision Tool Room Type Hydraulic Feed Surface Grinder . . . accuracy assured by such features as hand-scraped V-shaped ways, rigid one-piece column and base casting, truly automatic cross feed and extra-heavy spindle. Why settle for less?

For information on the No. 560 or the Nos. 550, 360 and 350 Tool Room Type Surface Grinders, send a note on your letterhead.



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H. Frommelt



H. B. Carroll, Jr.

Frommelt Heads Ferro Research

Horace Frommelt, a specialist in metal removal, has been appointed Director of Manufacturing Research for Ferro Powdered Metals, Inc., it was announced by J. F. Helsel, president. Frommelt had been Director of the Spring Garden Institute—Metal Removal Center in Philadelphia. He has headed many projects with Ferro, Helsel said.

A graduate of Iowa University, Frommelt was formerly head of the Mechanical Engineering Dept. at Marquette University. He has also been associated with Kearney and Trecker and the Kennametal Division.

"Mr. Frommelt," Helsel noted, "will accelerate our research programs, particularly in new applications for powdered metallurgical components. We are also interested in new products which can use the tremendous experience we have acquired in powdered metals and related fields."

Frommelt will temporarily head-quarter in Springfield, Mass., where he is on a special assignment for Ferro. He is expected to move to the company's main office in Salem, Ind., later this year.

Sheldon Machine Elects Pres.

Howard B. Carroll, Jr., has been elected president and general manager of the Sheldon Machine Co., Inc., Chicago. Sheldon held the position of vice president since 1956. He came from the Ford Motor Co. of Detroit in 1951 to join the Sheldon sales force.

Dexco Corp.'s Raymac Div. Settles in New Quarters

Stuart W. Pollock, president, announces that Dexco Corp.'s Raymac Div. has been moved to a new location at 15778 Telegraph Rd., Detroit 39, Mich. This division is devoted to development and manufacture of solid carbide cutting tools. Their new 1961 catalog of solid carbide tools, according to Pollock, is ready for distribution.

In Raymac's special tool department extreme care is used in production of tools made to print and tools for specific applications.

New precision equipment has been installed and further additions will soon be made to expand the facilities to take care of increasing sales.

The extractor department occupies new quarters at 7744 Greenfield Rd. in Dearborn, where work is undertaken for major automotive firms and other industries to remove broken drills, taps, or do other repair work on expensive machined parts and hardened steels.



S. W. Pollock



H. O. Spier

Rolled Steel Corp. Establishes Export Division

The popular misconception that in every instance foreign countries can undercut American production costs was refuted by Irwin D. Harris, chairman of the board, Rolled Steel Corp., Skokie, Ill. In announcing the establishment of an export division, Harris said there is a great demand for flat rolled stock in the markets of Western Europe as well as Latin America and

the Far East. Rolled Steel will export its complete line of aluminum, stainless steel, and carbon and galvanized steel including steel sheets, bars, plates, angles, coils, and structurals.

Heinz O. Spier has been named vice president in charge of export operations. He brings to the company 14 years of experience in all phases of export, management, international sales, and overseas licensing operations.

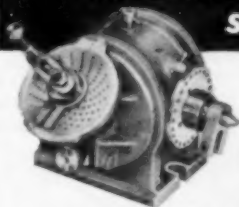
The new division will be called Rolled Steel International, with offices in Skokie.

Industrial "First" For Boeing



■ A method of bending 8" dia. .044 thin-wall tubing with a bend radius of 2.5D has been perfected at Boeing Airplane Co.'s Wichita, Kansas Division, single source production center for the new Strategic Air Command B-52H missile bomber. It is claimed that use of 8" aluminum tubing in aircraft production had not been possible before development of the new Boeing technique. It is hoped that the bend radius can be reduced to 1.5D on heavier wall material. Aluminum Co. of America produced the 8" tubing to Boeing specifications. • • •

TOOLROOM ACCURACY PRODUCTION LINE STAMINA



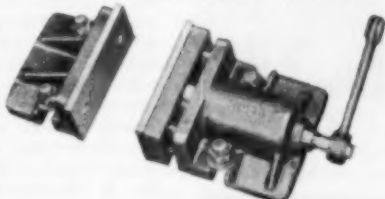
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5" MACHINE VISE

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QUICK-CLAMP MIL-VISE

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Jaw Opening — Unlimited

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Appointments and Promotions

Personnel Changes . . . Executive and Production

Gene A. White has been elected president of Cogsdill Tool Products, Inc., Oak Park, Mich. He succeeds **Frank A. Cogsdill**, who has been named vice chairman of the board of directors. **Bradley N. Brown** has been elected treasurer . . . **Fred T. L. Grimm**, formerly purchasing agent of the Detroit plants of Ex-Cell-O Corp., has been named director of purchases. Grimm replaces **Fred Sickelsteel**, who retired early in September . . . **William G. Bancroft**, with Cincinnati Milling since 1953, has been appointed the new manager of the Grinding Wheel Plant for the Products Div. of The Cincinnati Milling Machine Co. He succeeds **Maurice Germly**, who is now manager of the Products Div. . . . **John R. Strom**, chemist and process engineer for the Roto-Finish Co., Kalamazoo, Mich., has been named to the newly created post of technical director of the Ransohoff Co., Hamilton, Ohio. Both Roto-Finish and Ransohoff are under the same management . . . **Henry M. Crossen** has been appointed vice president-manufacturing of the Clearing, Div. of U.S. Industries, Inc., Chicago. Crossen came to the firm from the Stamping Div. of the Ford Motor Co. in 1959 . . . **R. J. Foresman**, veteran coated-abrasive executive, has been named a vice president of Michigan Abrasive Co., Detroit. Foresman formerly served with Midwest Abrasive Co. of Owosso, and more recently, the American Lincoln Corp. of Toledo . . . **H. F. Froehlich** has been appointed works manager of the Royal Oak (Mich.) Equipment Plant of the Ford Motor Co.'s Tractor and Implement Div., Birmingham, Mich. He was formerly vice president-manufacturing for Sherman Products Inc. before that company's acquisition by Ford in July . . . **Julius J. Harwood** has been named manager of the Metallurgy Dept. of Ford Motor Co.'s Scientific Laboratory, Dearborn, Mich. Previously Harwood was head of the Metallurgy Branch of the Office of Naval Research, which he joined at the time of its creation in 1946 . . . **Frank W. Rickard** has been elected a group vice



F. T. L. Grimm



J. R. Strom



R. J. Foresman



W. G. Bancroft



H. M. Crossen



H. F. Froehlich



T. L. Watson



E. K. Johansen

president of Borg-Warner Corp., Chicago, and will exercise general managerial supervision over several of the company's automotive divisions. Rickard will continue in his present capacity as president of Mechanics Universal Joint Div. of Borg-Warner at Rockford, Ill. . . . **John L. Turnbaugh** has been appointed manager of The Black and Decker Mfg. Co.'s Towson, Md. plant. He replaces **Karl B. Salanda**, who has resigned his position with the company. . . **Harold H. Mitchell**, formerly with the I-T-E

Circuit Breaker Co., has joined the King Machine & Mfg. Co., Los Angeles, as vice president. . . Aluminum Co. of America, Pittsburgh, has announced three changes in its executive management: **Lawrence Litchfield, Jr.**, executive vice president, and a member of the board of directors, was named president. **Frank L. Magee**, Alcoa's president since 1957, was elected chairman of the board and will continue as the company's chief executive officer. **I. W. Wilson**, chairman of the board since 1957, was named chairman of the company's Finance Committee. . . **Miss Thelma L. Watson**, with the firm 19 years, has been appointed as executive vice president and treasurer of Carter Products Co., Inc., Grand Rapids, Mich. . . . **Einar K. Johansen**, one of the founders of the Clearing Division, has been named vice president-engineering for Clearing Div. of U.S. Industries, Inc., Chicago. . . **Alden P. Taber** has been elected a vice president of The Babcock & Wilcox Co., New York City, and placed in charge of the Research and Development Div. He joined the company in June, 1959.

Personnel Changes . . . Sales and Service



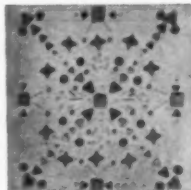
R. E. Rassel



J. P. Kennedy

Richard E. Rassel, with the firm since 1934, has been appointed by the E. W.

Bliss Co. of Canton, Ohio, to the newly created post of manager of automotive press sales. His office will be at Bliss' Detroit regional offices at 6770 E. Davison Ave. . . . **James P. Kennedy** has been appointed general sales manager for Ace Abrasive Laboratories, Inc., Mineola, N.Y. Kennedy has been in the diamond tool and abrasives line since 1945. . . **Robert F. Myers**, formerly with Lees-Bradner and Motch & Merryweather, has been named sales manager for the Productive Tool Service, Inc., Cleveland.



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Both NEW and DIFFERENT SHELDON 15" PRECISION LATHES



IR60P
5' bed—31" centers

Send in coupon
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This is an all new lathe that bridges the gap between conventional belt driven and geared head lathes. It combines the capacity and power of a geared head with the economy and flexibility of a belt driven lathe. Available with 5', 6' and 8' bed lengths providing 31", 42" and 66" center distances.

NEW

- New. Revolutionary double-box Headstock (Pat. Pend.)
- New. "WORK-HOLDING ONLY" Spindle.
- New. Single-Shift Back Gear Lever on Headstock.
- New. Headstock and Apron running in oil.
- New. 1½" Hole through Spindle.
- New. 60-pitch Gear Box with built-in Lead Screw Reverse.
- New. Amazing LOW PRICE.

DIFFERENT

- Different. Spindle rigidly held in two large "Zero Precision tapered roller bearings arranged in box-type design.
- Different. Electrical switches and push-button stations fully enclosed in built-in well in headstock.
- Different. Two independent clutches in apron for selecting power feeds.
- Different. Cam-action tailstock clamp for rapid release and instant locking of tailstock.
- Different. Triple, cogged, V-belt outboard drive—eliminates intermediate shafts—delivers more power to spindle.

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Gentlemen: Please send me information on items checked.

- ☐ The NEW and DIFFERENT SHELDON 15" Lathes
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- ☐ 11" and 13" Variable Speed Lathes
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- ☐ Have representative Call

Name..... Title.....

Company Name

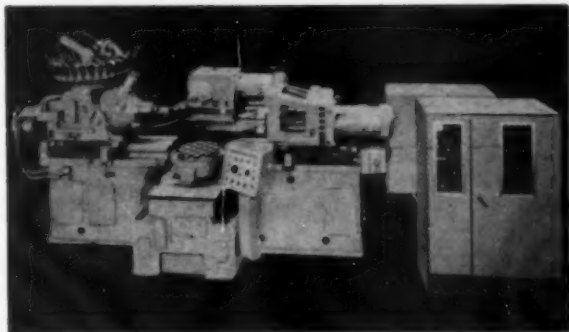
Street Address

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- ☐ Home

City..... Zone..... State.....

what's new in metalworking

17



New tape controlled machine tool which "brings production line efficiency to batch lot production."

TAPE CONTROLLED MACHINE AUTOMATES JOB LOT PRODUCTION

A new machine tool which "brings production line efficiency to batch lot production" of parts requiring face and other milling cuts, plus drilling, boring, reaming, and tapping operations, was announced by the Industrial Systems Div. of Hughes Aircraft Co. The new MT-3 Machining Center performs machining work on varied parts in sizes up to that contained in a 12" cube. Manufacturing lot quantities from five to 500 parts is easily handled. The three-station machine has independent spindle drive motors, each with 5 to 7½ hp capacity.

Designed on the building block principle, the machine has a central positioning table surrounded by three tape controlled work heads: (1) a universal drilling, tapping, and boring head, with storage capacity for 30 tools, which changes tools in less than three seconds; (2) a face milling head; (3) and optionally, a multiple spindle drill head or a precision boring head with a 14-tool capacity changer. The machine may be purchased without the third head if manufacturing needs do not require it.

A Hughes electronic numerical control system directs the machine's operations. Transposition of engineering information from drawing to control tape is accomplished by an inexpensive tape preparation unit.

Hughes Aircraft Co., Industrial Systems Div., P.O. Box 90904, Airport Station, Los Angeles 45, Calif.

Use postpaid card. Circle No. 68

Cut Machining Unit Has 8" x 8" Solid Bar Capacity

The Wallace Oscilla-Modular is available in five sizes—16" wheels, 18" wheels, 20" wheels, 26" wheels, and 34" wheels—with capacities up to 8" x 8" solid bars.

The company reports the machine has cut up to 8" solid high alloy bars, with micro-finish dimensions, i.e., profilometer readings as fine as -32 . The machines cut at a rate of from four to ten seconds, depending upon the character of material being cut for each square inch of material cut. A 6" x 6" bar of 2340 alloy heat treated to 220,000 lb. with a Rockwell C hardness of approximately 48 was cut at a rate of $4\frac{3}{4}$ seconds per square inch. Usual time allowed was approximately seven seconds per square inch.

An external and separate supply of coolant, which is pumped through a three-way coolant distributing system at the rate of up to 45 gallons per minute, keeps the work cool. A dual settlement system, in conjunction with the independent outside coolant system, provides three chip and sediment traps.

Oscillation is by Bellows air motors with hydraulic check. It can be very

Oscillation can be at speeds up to 100 strokes per minute, with length of stroke $\frac{5}{8}$ " to 6".

slow or at speeds up to 100 strokes per minute, infinitely variable. Length of stroke can be adjusted from $\frac{5}{8}$ " to 6". At the operator's selection are innumerable combinations of strokes and cycle time. Where oscillation is not needed, it can be shut off.

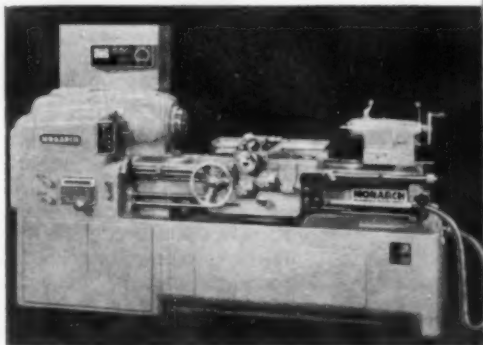
Wallace Supplies Mfg. Co., 1300 Diversey Parkway, Chicago 14, Ill.

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Push Buttons Control Lathe's Speed Preselection

The Monarch Series EE Model 1000 is a versatile, 15 hp precision lathe suitable for manufacturing or for toolroom use. It swings 16" over the bed, $8\frac{3}{4}$ " over the cross slide, and is offered in 30" and 54" center distances.

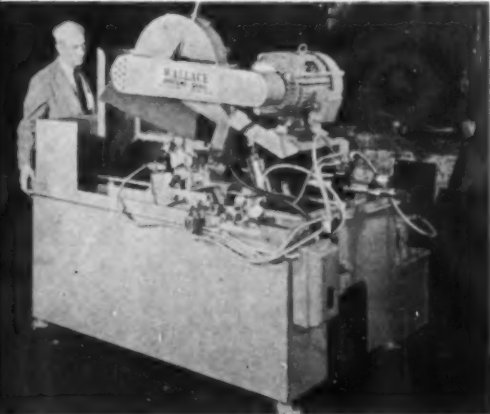
Infinitely variable speeds, forward or



Lathe swings 16" over the bed, $8\frac{3}{4}$ " over the cross slide, and is offered in 30" and 54" center distances.

reverse, may be secured between 20 and 2000 rpm. There are four ranges; the first three being geared and the other direct through the multiple "V" belt drive. All gearing is idle when the direct high speed range is engaged.

Speed control is all-electric while the shift itself is hydraulically actuated. A selector switch at the apron provides desired speed range and nearby control knob any speed within the range. In plain view of the operator is a tachometer which shows continuously the speed



at which the spindle is operating. Up to four speeds may be preset in any one range by means of potentiometer control and made operative as required during the turning cycle by depressing pushbuttons.

The D. C. main drive motor secures its power through an electronic conversion unit. Vibration and noise are minimized by the absence of revolving equipment in the power supply.

The gear box carries a range of 66 threads and feeds.

A particularly sturdy tailstock of the quick clamping type is furnished. Bed ways for both the carriage and tailstock are flame hardened and precision ground. Lubrication throughout the machine is automatic. There is a combined mist and liquid system in the headstock. Optionally the model is supplied with built-in constant surface cutting speed.

The Monarch Machine Tool Co., Sidney, Ohio.

Use postpaid card. Circle No. 79

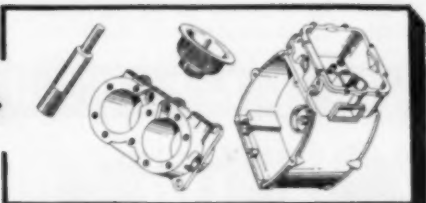
GREATER PRODUCTIVITY

AND

MORE ACCURACY

WITH

LESS MANPOWER



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... line of standard and special machines for drilling and tapping are an integral part of the Townsend line of full-range machining operations.* Greater economy and production efficiency from Townsend qualimatic machines has made Townsend of Hartford a leader in qualimatic mechanization. Our sales engineer will see you at your convenience. Write, wire, or phone.

Better PERFORMANCE and MORE PROFIT for you!

**Metal sawing machines, duplex spline millers, spring presses, drilling machines, high speed shavers, riveters, automatic screw machines, special machines.*



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OF HARTFORD

QUALI-MATIC MACHINES

THE H. P. TOWNSEND MANUFACTURING CO. - BROOK ST., WEST HARTFORD 10, CONN.

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Standard Hobbing Machines Are Now Automatic

Standard-type hobbing machines, on which all functions of the hob carriage and workslide are controlled automatically, are reported economical for both high-volume and job-lot production of gears and splines. The No. 16-16 "Multi-cycle" machine has three different pre-selected work cycles—square cycle, plunge cycle, and plunge-approach cycle.

The power vertical feed permits hobbing worm gears in addition to the usual range of spur and helical gears and splines. Power feed in both horizontal and vertical axes reduces the approach time required to produce a gear.

Cams control actuation of workslide and variable vertical feed. Convenience of cam adjustment, plus easy preselection of machine cycle and quick setup, make automatic cycling practical for any number of pieces to be produced.

Multi-cycle versions of both the stand-













Cams (upper left) control actuation of workslide and variable vertical feed.

ard 16" and 6" Barber-Colman hobbing machines are now available, without change in work or hob size specifications or machine capacity.

Barber-Colman Co., 593 Loomis St., Rockford, Ill.

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FOR COST-CUTTING SPEED AND ACCURACY

					
Angle Plates	Slotted Angles	Box Parallels	Vee Blocks	Straight Edges	Aluminum Angles
					
Alum. Mt. Blocks	Boring Mill Parallels	Adj. Layout Angle Plates	Cylinder Squares	Scale Holders	Extension-Height Blocks

All of the precision accessories shown . . . and more, too . . . are immediately available in a wide range of standard sizes or in special sizes to specifications. Complete line of layout plates, floor plates, cast iron and black granite surface plates offered, too. Send for your FREE catalog today.

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heats like...

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NO BLOWER OR POWER NEEDED

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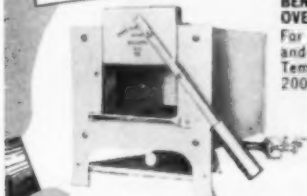
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Temperatures to
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Est. 1911

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tomorrow.



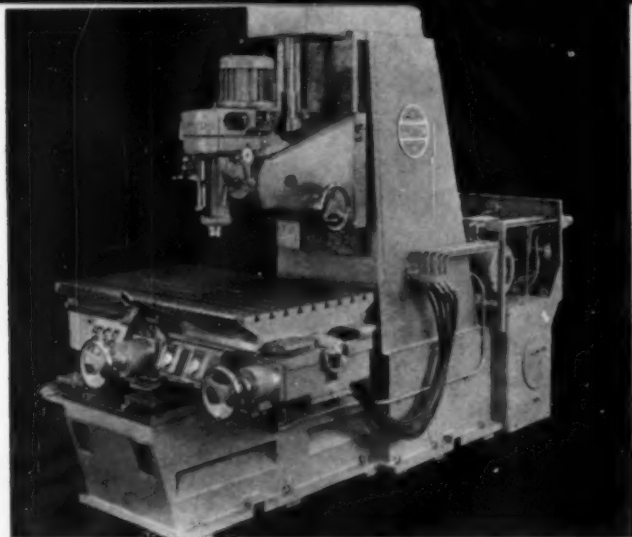
The standardized ROSSPUNCH is stocked in tool steel and high speed tool steel. Let us supply you at one-third the cost of making them yourself—a 60% saving! Complete satisfaction guaranteed.

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ROSS Equipment co. inc.

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Machine is provided with Vernac optical units for location of holes in plates within $\pm .0005''$.

Jig Boring/Milling Machine For Light Milling, Hole-Spacing and Boring

The George Gorton Machine Co. of Racine, Wis., has recently installed a special vertical jig boring/milling type machine for multi-purpose precision boring and milling at the National Cash Register Co. at Dayton.

The large capacity and versatility of the machine facilitates the milling of flanges, bosses, etc., on large cast members. The precision drilling and boring capabilities reduce the time required to produce prototype parts, tooling plates, templates, etc.

This machine, featuring 36" x 54" table capacity, is designed for precision drilling and boring operations, and box cycle milling. The machine is provided with Vernac optical units for precision location of holes in plates within $\pm .0005''$.

The design employs building block principle in conjunction with standard components. The head is the Gorton 1-22 Mastermil head and spindle assembly. Spindle is powered by a 2 hp motor, providing 20 speeds from 40 to 5600 rpm; spindle power feed infinitely variable 0" to 5" per minute.

The saddle (cross) and table (longitudinal) motions are actuated by two hydraulic motors. These motors provide variable feed traverse rates of 1" to 30" per minute and push-button rapid traverse of 60" per minute.

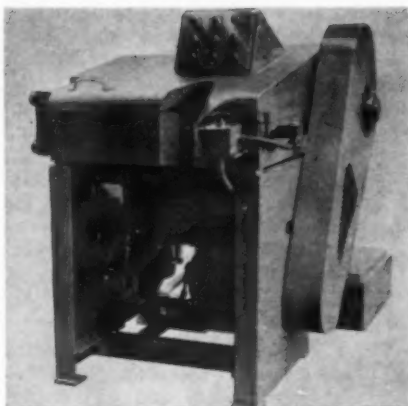
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Uniformity In Tube Flaring With High Speed Flaring Unit

The Model M-I-H tube double flaring machine consists of six basic integrated mechanisms; a motor-driven mechanical press, a mechanical punch-shifting and tube clamping mechanism, air for the pneumatic clutch, brake and safety air cylinder in the lock-up mechanism, all points involved in dimensional control are micrometer adjustable, change to a single flare operation requires minutes. Machine is controlled by an electrical panel.

Crankshaft of the machine has a 16 ton capacity, a 3" stroke, pneumatic clutch and brake, a 3 hp motor with a variable drive, three phase 220/440 60 cycle AC.

The machine is designed to produce,



1/8"-.028 to 1"-.049 steel tubing capacity. at one operation, a double flare at high-speed on steel or non-ferrous tubing. It is reported more accurate in density at high speed operation, and provides greater uniformity in tube flaring.

Tube capacity is 1/4"-.028 to 1"-.049 steel tubing. Rate of output is 200 to 340 strokes per minute (two strokes per flare). Working height of the machine is 39".

Accord Tool & Machine, Inc., Southfield, Mich.

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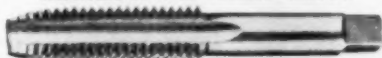


"If you've heard it, be sure and stop me. . ."

Why Wait FOR SPECIAL TAPS, DIES AND GAGES?

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SPECIAL

(Also available in high speed left hand)

HIGH SPEED

SIZE	THREAD
4	32-48-60-84
5	30-32-36-48-60
6	36-48-48-56-60
7	32-40
8	24-30-38-38-40-44-48
9	24-28-32-40
10	28-30-36-40-48-64
12	20-28-32-36
14	20-24-28
1/10	60-64
5/64	72
3/32	48
7/64	40-56
1/8	32-40
5/32	32-36-40
9/64	36-40
11/64	36
3/16	28-24-32
13/64	32
7/32	24-28-32
1/4	18-24-28-27-30-32-36-40
5/16	16-20-22-27-28-32-40

RIGHT HAND TAPS

SIZE	THREAD
1-3/4	8-10-12-14-16-18-20-24
1-13/16	8-10-12-14-16-18-20
1-7/8	8-10-12-14-16-18-20-24
1-15/16	8-10-12-14-16-18-20-24
2	4-1/2-8-10-12-16-18-20
2-1/16	12-14
2-1/8	12-16-20
2-3/16	12-16
2-1/4	4-1/2-8-12-14-16-18
2-5/16	12-18
2-3/8	12-16-18
2-1/2	8-10-12
2-9/16	18
2-5/8	12-16-20
2-3/4	16
2-7/8	8-12-18
3	8-16
3-1/4	8-12-16
3-1/2	8-12-16
3-7/8	8
4	8-12

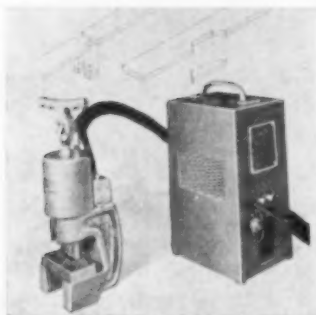
3/8	12-16-18-20-27-28-32-36-40-48
7/16	12-16-18-22-24-27-28-30-32-36-40
1/2	12-14-16-18-22-24-26-27-28-30-32-40
9/16	16-20-24-27-28-30-32-40-48
5/8	12-14-16-20-24-27-28-32-36-40
11/16	11-16-18-20-24-27-28-30-32
3/4	9-11-12-14-18-20-24-26-27-28-32
13/16	10-14-16-20-32
7/8	10-12-16-18-20-24-27-28-32
15/16	8-9-10-12-14-16-18-20-24-32
1	10-12-16-18-20-24-27-32-40
1-1/16	12-14-16-18-20-24
1-1/8	8-10-14-16-18-20-24-32
1-3/16	8-10-12-14-16-18-20-24
1-1/4	8-10-14-16-18-20-24-32
1-5/16	12-14-16-18-20-24-32
1-3/8	8-10-14-16-18-20-24
1-7/16	8-10-12-16-18-20-24
1-1/2	8-10-14-16-18-20-24-28
1-9/16	18-20-24

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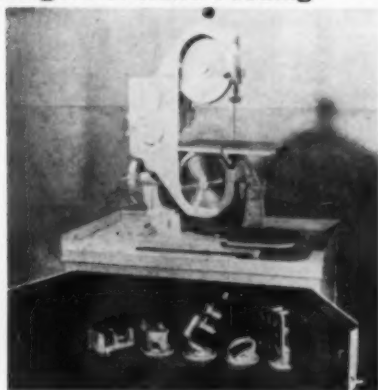
Portable Press Handles Notching and Cutoff Work

A new series of Hydramic notching presses has been announced in three portable models with capacities of 10, 20, and 30 tons. The presses handle maximum notching dimensions from 2" x 1" to 2½" x 2" in metal thicknesses up to ¾". A ½ hp hydraulic power unit is standard.

W. A. Whitney Mfg. Co., 636 Race St., Rockford, Ill.

Use postpaid card. Circle No. 74

Bandsaw Unit Eliminates Dangers of Hand Feeding



Universal cutting center. Swivel base equipment is also shown.

The Little Wizard universal bandsaw has quickly-attached holding fixtures which eliminate dangers of hand feeding. The unit is ready to cut vertically,

horizontally, or angularly—possible because of counter-balanced angle positioning with upper and lower tables. Nine speeds are offered, in three variable speed zones. Material which can be cut includes wood, rubber, plastic, steel, iron, etc.

Larger size model cuts 5" dia. bars to 8" lengths; 2¼" bars, any length. The smaller size cuts 1/16" dia. wire, any length; ⅛" pins, screws, dowels, etc., any length.

Unit is designed for bench or floor adaptation.

Swivel base equipment for use with the unit includes adjustable angle-plate, V-block clamp, vise, and adjustable angle vise.

Hack Engineering & Machine Co., Inc., 1228-32 Harding Ave., P.O. Box 152, Des Plaines, Ill.

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Head Eliminates Manual Tapping For Tool & Die Makers

The manufacturer states that previously the tool maker found it took at least 10 or 15 minutes to set up a production tapping head—thus it became simpler and faster for him to do the job by hand. Babcock Mfg. claims that since the new Babco tapping head chucks in a drill press in a matter of 10 seconds, the tool maker can save time even if he has only one hole to tap.

Unit is priced at \$13.95.

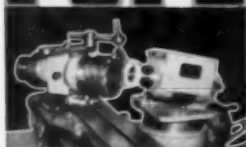
Babcock Mfg. Co., 5632 Shafter Ave., Oakland 18, Calif.

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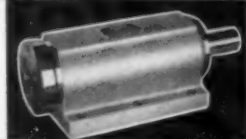
specify **POPE** PRECISION SPINDLES

GRINDING



pictured is Pope P-6651-B Motorized Super-Precision Tilting Head for No. 2 Cincinnati Tool and Cutter Grinders. It is but one of hundreds of different Pope Grinding Spindles — motorized, belt driven, external, internal, deep hole, etc.

BORING



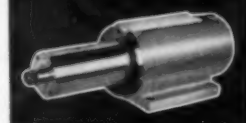
shown is Pope P-18501B Heavy Duty, Flange Nose, Belt Driven Precision Spindle for large deep hole boring and facing tools. Others include multi-spindle boring heads, motorized and motorized-belt driven high speed heads and super-precision heads for boring holes round.

MILLING



this Pope P-12007-M50 Heavy Duty, Belt Driven Spindle is available in sizes from 1 to 50 HP with standard No. 10, 20, 34, 40, 50 or 60 milling machine noses. (Ask for Bulletin S-17.) Other milling spindles include motor driven, gear hobbing, tracing attachment, right angle and offset types.

GRINDING MILLING DRILLING CUTTING



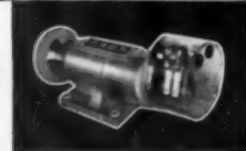
this Pope P-1029-AU Motorized, Heavy Duty Spindle is available from 900 to 3600 RPM and up to 20 HP. Shaft can be arranged to hold grinding wheels, milling cutters, drills or other cutting tools. Quick-change collet chucks are used for drilling, universal collet chucks for end milling.

HIGH FREQUENCY



this Pope P-940 Motorized, Water Cooled, Oil Mist Lubricated, Grinding Spindle runs at 100,000 RPM, features low maintenance cost. Others are available for milling and for vertical or horizontal operation.

ANOCUT ELECTROLYTIC GRINDING



this Pope P-19126-AN Spindle has built-in insulation and rugged fork type cool operating brush assembly for transmitting low voltage high amperage current to the wheel. Others include belt driven types and are arranged to operate from 50 to 3000 amps.

One of the 20,000 different Pope Spindles may be just the one you need. May we have your specifications?

No. 133

POPE®

**ENGINEERS, DESIGNS AND BUILDS
PRECISION ANTI-FRICTION BEARING SPINDLES
FOR EVERY PURPOSE**

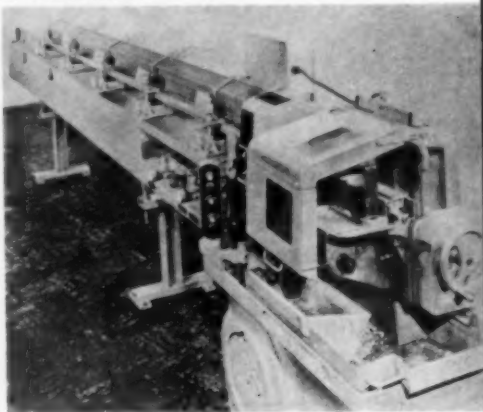
POPE MACHINERY CORPORATION • 261 RIVER STREET • HAVERHILL, MASS.

Established 1920

Bar Feed Worked With High Speed Automatic

The Lipe-Rollway Model 56 AML bar feed fed stock to the new 10,000 rpm spindle speed Brown & Sharpe automatic in an on-the-spot demonstration at the Chicago Machine Tool Exposition. It helped produce a machined brass part at the 10,000 rpm spindle speed. To do this, the Lipe bar feed was equipped with a new high speed feeding attachment. At first the rate of rpm presented what seemed an almost insurmountable feeding problem. The tremendous centrifugal force created by the high revolutions per minute threw up an invisible barrier which prevented moving the stock forward. No practical amount of counteracting force was able to overcome this.

Lipe-Rollway engineers solved the problem by installing a floating spindle liner in the bar feed. A brake is applied to this floating liner to cancel out the effects of the centrifugal force. The floating spindle liner revolves on a



special set of long life nylon bearings, and the brake is applied when the collet opens.

The newest development has been the ability of the bar feed to handle many odd-shaped stocks—triangular, rectan-

How SQUARE HOLED SLEEVES SPEED UP TOOL-MAKING!

One of the most difficult problems in tool making can be solved easily and quickly with Sturdy Square Holed Sleeves. The perfection of broached square holes can be had in boring bars, milling cutters and many other applications at a small fraction of the cost of imperfect hand-made square holes. The Sturdy Square Holed Sleeve consists of a round sleeve with a perfectly square hole broached through the center. This hole is tapped at one end to receive a back-up screw which is furnished with the Sleeve. The Sleeve can be sweated or pressed into a drilled and reamed hole to make a perfectly square accurate hole in a very few minutes.

The Sturdy Square Holed Sleeve will save you many hours and many dollars in the making of boring bars, tool holders and other tools requiring square holes.

SLEEVES MADE IN FOLLOWING SIZES:
3-16, 1-4, 5-16, 3-8, 7-16, 1-2, 5-8, 3-4, 1"

STURDY BROACHING SERVICE, INC.
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*Write for
Literature*



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gular, etc. It has cut labor and costs with circular stock.

One of the nation's largest automotive manufacturers is successfully using the bar feeds to run triangular stock. Underwood Corp., Hartford, Conn., is currently using them to machine five different business machine components, using rectangular stock.

Brown & Sharpe Mfg. Co., Providence 1, R.I.

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Tables give accurate indexing in increments of 15 minutes.

Rotary Indexing Tables For Fractions of Degrees

The Milichex rotary indexing table Model M2X-900, for fractions of angles, has a double-table arrangement which allows setting angles to quarter degrees with accuracy of $\frac{1}{4}$ second of arc. Useful for either inspection or machining, the table eliminates gage blocks and permits an unskilled operator to quickly set and reproduce any angle in increments of 15 minutes.

Lower table is a standard Milichex Model MX-3600 360-tooth rotary table indexing in full degrees. Upper table is a special 96-tooth rotary table with each tooth equal to $3^{\circ}45'$.

Table top is 12" dia., and parallel with base within 0.000050". Drilled holes allow attachment of workpieces.

Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.

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you...

THE TRAFFIC MAN said



"SAVE TIME!"

The Traffic Men said. "O.K.!"

said Cooper-Jarrett.

And we did!

Cooper-Jarrett... ***THE TRAFFIC MAN'S LINE**

... installed a new... almost completely automatic... and error free system that allows us to get your shipments off hours earlier than usual. How? By saving some three hours on each departure. Hours saved because of no need to wait for billing. It's taken care of by the Cooper-Jarrett teletype and I.B.M. system.

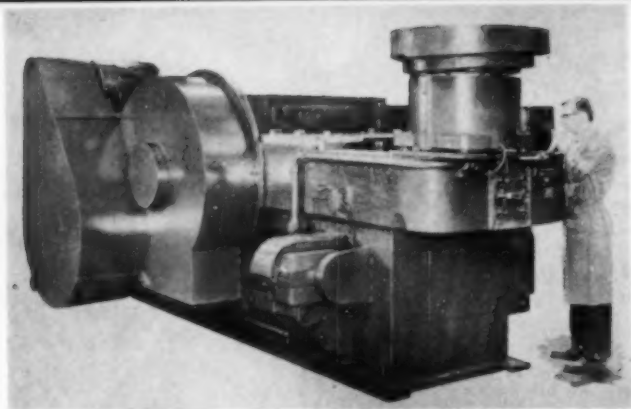
And... Cooper-Jarrett, "Maximum Maintenance" of equipment means the time saved at the start gives you faster customer delivery.



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Extrusion Press Delivers 120 Aluminum Cans Per Minute

Seamless aluminum cans are now being impact extruded at the rate of 120 per minute on a new 300-ton impact extrusion Maxipres. The press, soon to be shipped to a brewery in the West, delivers the cans in an oriented manner ready for trimming, flanging, cleaning, coating, filling, and closing.

The cans, which start as discs $\frac{1}{8}$ " thick and $2\frac{1}{2}$ " in diameter, have a height of over 5" as they emerge from the machine.

The 48,000 lb. press has a rugged cast steel bedframe capable of absorbing the

shock of impact extrusion. A simple die adjustment varies the bottom thickness of the can while the press is running. A tonnage indicator shows the tonnage generated during the press cycle. The press is made safe against any malfunction.

According to National, impact extrusion is regarded as potentially the lowest-cost method of aluminum can fabrication—the other two are the conventional three-piece method and deep drawing.

The National Machinery Co., Tiffin, Ohio.

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DYNAMICALLY BALANCED ADJUSTABLE HUB CLAMPS are designed to insure maximum performance of high speed precision motors, synchros, resolvers, and instrument shafts. The improved clamps are available in $\frac{1}{8}$ ", $3/16$ ", and $1/4$ " shaft sizes. Conforming to MIL specifications, they are made from heat treated, No. 416 stainless steel. PIC Design Corp., 477 Atlantic Ave., E. Rockaway, L.I., N.Y.

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SPELLMACO "SPOTTERS"

A matched set of transfer punches for toolmakers, machinists & tool cribs

Used for transferring location of threaded, drilled and reamed holes, slugs, blanks, etc.

Precision made of finest tool steel—Carefully heat treated and tempered for long life—.0025 undersize to facilitate use—Black oxide finish

Set No. 3-17, 28 punches with indexed stand—sizes $3/32$ " to $1/2$ ", by $1/64$ "—plus handy $17/32$ " size. Length $4-7/8$ " ONLY \$19.40

Single sizes available

R. L. SPELLMAN CO. - URBANA, OHIO

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MACHINE and TOOL BLUE BOOK



Delivers torque to 150 ft. lb.

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Wrench For Hard-to-Reach Tightening

Designed for "impossible-to-reach" tightening jobs on bolts and nuts, the No. 17B-5 ratchet wrench is said to deliver torque to 150 ft.lb. Power unit for this tool is the same basic air motor used in other No. 5 series Gardner-Denver tools. Six attachments are available with side plates from 1¼" to 3½". Attachment thicknesses are ⅞" (up to 2½" side plate width) and 1" (for 3" and 3½" side plate widths). Hexagon and square sockets are available.

Gardner-Denver Co., Quincy, Ill.

NEW PINES

HIGH PRODUCTION END FINISHER

for

- TUBE
- ROD
- PIPE

New Model 660 Speeds Chamfering • Deburring • Facing • Drilling • Reaming • Tube-End Forming

- Rugged new design for high production, easy operation, faster feeds on simultaneous inside-outside deburring, chamfering, facing.
- New rigid, unitized spindle frame and heavier base retains close concentricity between the tool holder and chuck jaws.
- Simplified setup, operation, maintenance . . . one-minute speed changes with new hinged safety guard and pivoted motor mount.
- Production to 800 ends an hour . . . capacity to 2" O.D. . . air operation, larger units or special machines are also available.

Write for catalog giving cost cutting features, production data, complete specifications.

PINES ENGINEERING CO., INC.

Specialists in Tube Fabricating Machinery

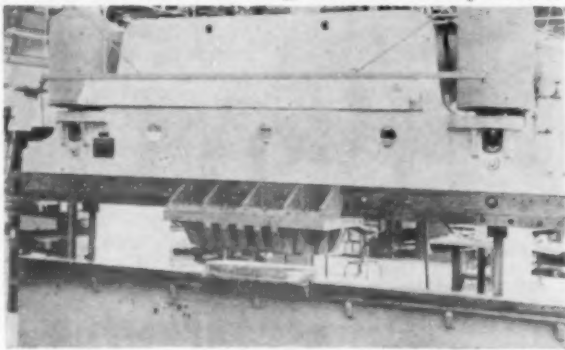
605 WALNUT • AURORA, ILLINOIS



Hydraulic Press Brake Permits Hot Forming Missile Components

Ability of a hydraulic press brake to stop at bottom of stroke and maintain exact depth under tonnage for a predetermined length of time permits use of the Guerin process in hot forming thoriated magnesium, aluminum, and stainless steel at Lockheed Missile Div., Sunnyvale, Calif. Draws up to $\frac{7}{8}$ " for internal bracketry have been successful. Structures of Polaris missile and Agena satellite are hot formed within 30 seconds at temperatures of 750° F.

The 200 ton press brake is equipped with decompression circuitry in the hy-



Missile structures are hot formed within 30 sec. at 750° F.

draulic system and maintains a steady 900 psi pressure throughout the dwell.

Press brake is manufactured by Pacific Industrial Manufacturing Co., 848 49th Ave., Oakland, Calif.

Use postpaid card. Circle No. 82

Drilling, Boring, Reaming and Tapping Machine

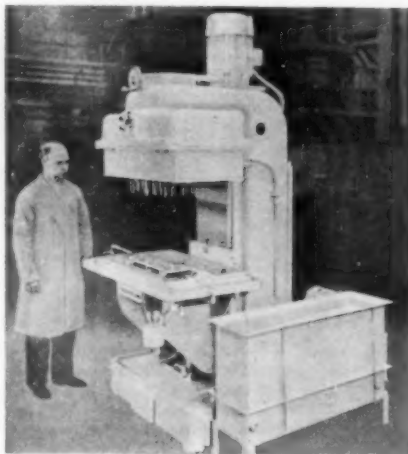
Sundstand's new precision drilling, boring, reaming, and tapping machine produces large number of holes on relatively complex parts. Design of the workheads eliminates all gearing, permitting close center distances, reducing cost of interchangeable workheads, and speeding changeovers.

Two models are available with either an 18" x 36" head or a 9" x 14" head. Machines are designed primarily for work with non-ferrous metal parts.

Complete workheads can be changed in 15 to 20 minutes. Added flexibility for similar parts is offered by equipping heads with spindles that can be fitted quickly with a tool as required.

Change-overs take no special operator skills since the head mates with the machine spindle, is located by dowels, and is held in place by four bolts. The workholding fixture is positioned quickly and simply in relation to the workhead.

Tolerances to .0002" are reported,



Design of workheads eliminates all gearing, permitting close center distances, reducing cost of interchangeable workheads, and speeding changeover.

which can be held for spatial relationship, shoulder depth, and hole size depending on size of part, shrinkage or



Punched hole part tolerances
such as $\pm .005$,
are as old-fashioned as sleeve garters!
They're throwing profits
in the wastebasket.
Go modern!

Know the profit saving facts
about Proven Usage Punch Sizes . . .
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or write for free literature

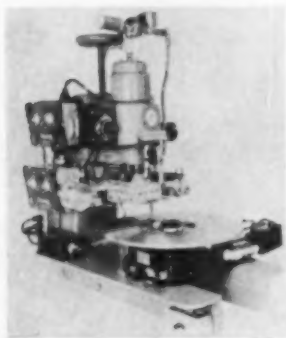
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expansion, material composition, tool maintenance, and other variables. Spatial accuracy is built into the head, fixtures, and the machine itself.

Workpiece is rapid traversed and fed to the tools by the vertical stroke of the table. Maximum feed stroke is 8" at rates variable from 1/2 to 100 ipm. Maximum rapid stroke is 18", up at 220 ipm and down at 270 ipm.

Sundstrand Machine Tool, Div. of Sundstrand Corp., Newburg Rd., Belvidere, Ill.

Use postpaid card. Circle No. 83



Dial Feeding Unit For Acromark Press

A new 4, 6, 8, 12, 24 station dial as a separately-operated unit is used in combination with Acromark Model No. 212 stamping machine mounted in any desired position beneath the Acroleaf press ram. This unit is constructed to withstand necessary stamping pressure, and may be mounted in any position. Dial plates are removable, sizes from 10" to 20" may be accommodated.

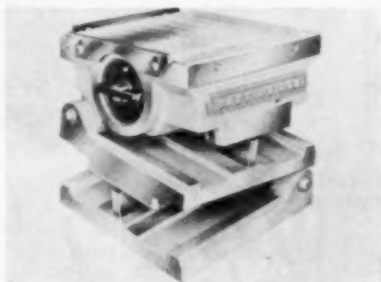
Machine illustrated has a loading timer for pre-setting loading speed and a separate timer to control the marking dwell. Operating speeds up to approximately 50 parts per minute can be attained. Automatic ejection can be provided for most workpieces. Combination machine is complete with all controls, starting switch, pressure, speed, etc., and operates from 60 psi or

more air line with 115 V.A. for the control circuit.

Unit may be removed from the No. 212 Acroleaf press for hot stamping individual products or items up to 5 1/2" high, and will reach to center of parts up to 14" deep.

The Acromark Co., 15 Morrell St., Elizabeth, N.J.

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Model 8866-2 for compound angles.

Chucks Set Light Machining Jobs To Simple Or Compound Angles

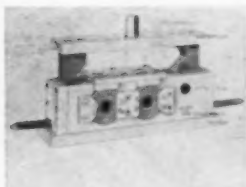
Two new sine angle models, for setting light machining or inspection jobs to either simple or compound angles, have been added to the Taft-Peirce line of Superpower permanent magnet chucks. A control knob on either side of model quickly energizes the magnetic surface for easy positioning of the work, or for maximum grip. Lock screws lock the plates at any angle. Angle settings are obtained by use of gage blocks. A precision-ground step on the base plate makes it possible to set angles down to zero. Adjustable back and end stops are provided on both models.

Both chucks feature a powerful rotary pack which is permanently magnetized and requires no wiring. The precision-ground work surface is flat, square with the sides, and parallel to the base within .0002".

Model 8866-1 is designed for simple angles; Model 8866-2, for compound angles.

Taft-Peirce Mfg. Co., Woonsocket, R.I.

Use postpaid card. Circle No. 85



Use postpaid card. Circle No. 86

Speedy Notching and Slotting

The new No. 102 Arc-Twin Tandem speedily makes two complete notched ends (four notchings) of pipe or tubing with one stroke of the punch press. By using the Vogel No. 110 outboard locator, notchings at both ends of a single pipe or tube can be accurately, automatically aligned or positioned with relation to each other. Notchings formed make perfect T-joints for welding and brazing; "T", flared, or long narrow slots can be made. Samples of machine's work is sent on request.

Vogel Tool and Die Corp., 1825 N. 32nd St., Stone Park, Ill.

ALINA SERIES "W" BORE GAGES

Range from .160" to 12"

Alina bore gages are extremely sensitive and designed for trouble-free operation. The three point centralization system locates the gage in the hole quickly and accurately. Alina bore gages will swiftly reveal taper, bell mouth, out of round, and other dimensional variations.

A push-button retracts the movable anvil for easy non-scratching insertion into the workpiece. This feature also saves wear on the anvils.

Each gage is equipped with tungsten carbide contact points for lasting on the job accuracy. (except model WO-1).

Bore gages with measuring depths up to 40" delivered on special order.

Model WO-1 available with measuring heads down to .160".

Furnished as a set complete with depth adjustment stops and fitted wooden case.



Completely enclosed gage head for greater protection against dust, etc.



WRITE FOR ILLUSTRATED LITERATURE

ALINA CORPORATION

122 East Second Street, Mineola, Long Island, New York

Use postpaid card. Circle No. 344



New Kendex® Dial-A-Breaker® permits close ganging of tools. All adjustments, chipbreaker and insert, can be made from top of holder.

The machine tool you buy is no better than its cutting tool

You may have looked at many ingenious machines and wizard-like controls at the Chicago Show. Perhaps you bought one . . . or are planning to . . . in the hope of increasing production, improving products or reducing costs. *But the final return on your machine investment depends upon the tooling.*

It doesn't pay to spend thousands of dollars on machines . . . then try to save a few pennies when tooling up

Whether the machine is one of the latest, high speed, numerically controlled types or an older model . . . you will make more, products and dollars, by equipping it with the BEST tools you can buy.

The best tooling is especially important for machines operated by numerical controls. Inserts must be of uniform quality for predictable service life. Toolholders must be designed for quick indexing of inserts and fast adjustment of chipbreakers . . . to minimize set-up time, improve accuracy and reduce scrap.

The new Kendex Dial-A-Breaker, shown above, is especially well suited for automated operations.

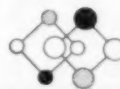
Its attached, quick-adjusting chipbreaker shortens set-up time, speeds insert indexing, assures optimum chip control and eliminates the need for a different chipbreaker for every job. *Only two sizes of chipbreakers are needed to service 76 styles and sizes of holders.* The Dial-A-Breaker eliminates chipbreaker grinding, simplifies stocking.

From the versatile Kendex line, you can get the tool best for every job. There are 110 standard styles and over 400 toolholders to select from. Or, we can help you develop special heads with Kendex throw-away inserts that may permit several operations to be performed in one pass.

For maximum production, make certain you have the most productive tooling on your machines. Call your Kennametal Representative. His only job is applying Kennametal® hard carbides to tooling and specialized uses. KENNAMETAL INC., Latrobe, Pennsylvania.

®Trademark

35061



INDUSTRY AND
KENNAMETAL
...Partners in Progress



**LOOKING FOR
A FASTER
AND MORE
ECONOMICAL
Way...**

**TO
FORM
COMPLICA-
TED WIRE &
Ribbon Metal
Parts**



If you are, it will pay you to investigate NILSON Fourslide Forming Machines, which can handle wire diameters from 0.010" to 0.5" (feed lengths to 32") and ribbon stock up to 4" wide (feed lengths to 24"). And, parts can be produced at rates over 400 per minute.

NOW—NILSON'S NEW "FOURSLIDE DESIGN & TOOLING HANDBOOK" is available !

For the first time, a NEW—"FOURSLIDE Design & Tooling Handbook" explains many important aspects of the FOURSLIDE PROCESS. It will help you in product design, in methods engineering, and in tooling. The HANDBOOK describes design aspects of parts formed on a FOURSLIDE; Drawings and descriptions of tooling design using actual examples; How to combine operations, such as stamping and forming, cut-off, forming

and welding, or forming and assembly. Many other facts also given.

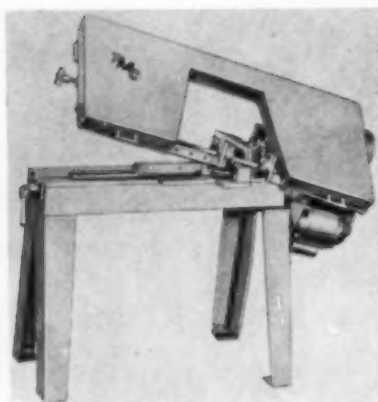
We invite you to write today for your free NILSON "FOURSLIDE DESIGN & TOOLING HANDBOOK". You will also receive the new NILSON Bulletin No. 62 covering the widest range of FOURSLIDES available —17 models



NILSON

A. H. Nilson Machine Company

626 Bridgeport Avenue Shelton, Connecticut Telephone: WAverly 9-1433



Vise accommodates cuts 90° to 45° angles.

Carbon Blade Band Saw With 6" x 10" Capacity

The new Model 610 carbon blade band saw accommodates pieces up to 6" high, 10" wide. The machine is powered with a ½ hp 110 volt motor which can be operated from a standard electric light

outlet; other voltages on order. The new saw is easily portable from place to place.

Featured is a fast-acting adjustable vise which accommodates cuts of from 90° to 45° angles. The saw has adjustable saw guides, infinitely adjustable pressure control, cast iron vise base and vise jaws, and is ruggedly constructed.

Machine can be used for portable contour work by putting the arm in a vertical position and using an accessory table.

Price of the model, less electrical, is \$545; and \$595 complete with electrical equipment.

Peerless Machine Co., 1600 Junction Ave., Racine, Wis.

Use postpaid card. Circle No. 81

Air and Hydraulic Cylinders In Strokes Up to 20"

A new line of air and hydraulic cylinders, known as Type "AS", is available in bore sizes of ¾", 1", 1½",

FOSTORIA LOCALITES

Model 55-BH-701



Koolshield:
Fits all old and
new model
Localite half
shade reflectors.

cool,
safe light...
right where
you need it!

- Ideal lamp for benches, machine tools, assembly lines.
- Instantly adjusts to any desired position.

New, friction-collar-disc joints permit instant positioning... light stays put under severe vibration. Nylon Koolshield snaps over reflector... remains cool to the touch. Universal base, rugged construction, heavy duty socket, Levolver switch.

Write for catalog of Localites for every industrial need.

Available through wholesalers everywhere.

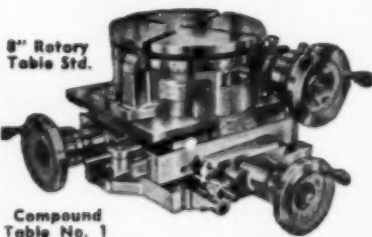
F FOSTORIA CORPORATION
FOSTORIA, OHIO

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The STEVENS Line

SINCE 1925

Introducing NEW Series



8" Rotary
Table Std.

Compound
Table No. 1

ROTARY TABLES, 3-8-12-15-18-24" sizes both standard & dial indexing types.

ADJUSTABLE TILTING TABLES, #1-2

COMPOUND TABLES, #1-#1½-#2

ROTARY-COMPOUND TABLES #1-1½-2

INDEX CENTERS - multiple spindle

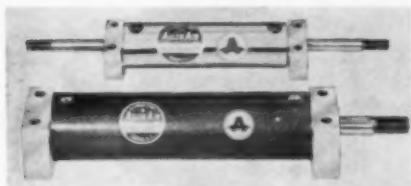
See your dealer or write for bulletins

The JOHN B. STEVENS Company

SOMERSVILLE, CONN.

Use postpaid card. Circle No. 347

MACHINE and TOOL BLUE BOOK



Bore sizes— $\frac{7}{8}$ ", $1\frac{1}{8}$ ", $1\frac{1}{2}$ ", 2".

and 2". These cylinders are either double acting, or spring return, as well

as double ended or single ended. Featured are one-piece square heads, ground and polished stainless steel rods, nylon bearings, and honed brass or steel tubes. Cushions are optional. A choice of packings is available.

The units are stocked in inches of strokes up to 20", but any stroke is available up to 168".

Allenair Corp., 255 E. 2nd St., Mineola, N.Y.

Use postpaid card. Circle No. 92

PRECISION DRILL GRINDING:

Black Diamond^{*}



does it better, faster, easier



1 INSERT



2 PUSH



3 TWIST



4 GRIND

Black Diamond Grinders are saving drills . . . saving labor costs . . . saving production time in actually thousands of shops. Reason #1: no drill grinder made does the job so fast and so easily . . . and there's absolutely no skill required! Anybody — yes anybody — can restore like-new sharpness to dull drills with absolute accuracy in just ten seconds!

If your drills, your time and your money are worth saving, you ought to get the facts. They're yours for the asking. Write exclusive distributor:

EDWARD BLAKE COMPANY, INC.

Dept. 5, 570 Pleasant Street, Watertown, Mass. WA 6-9100

***Black Diamond Saw & Machine Works, Inc.**

Natick, Mass. — Manufacturers of Black Diamond and Worcester Drill Grinders.

Black Diamond Drill Grinders: For #70 drills up to $\frac{1}{4}$ "

Worcester Drill Grinders: For $\frac{1}{4}$ " drills up to $2\frac{1}{2}$ "

Use postpaid card. Circle No. 348

Every Shop Should Own One



No distortion —
even on $\frac{1}{8}$ " stock!
MODEL "C"

KNURLMASTER Hand Knurler



For small production runs on $\frac{1}{8}$ " to 1" stock. Exclusive screw design gives perfect knurl pattern. Furnished with 3 hardened straight or diamond pattern knurls of standard $\frac{1}{8}$ " dia. Forged steel frame is self-centering. Write for illustrated folder.

ROCKWIN MANUFACTURING CO.

80-C Magnolia Ave., Westbury, L.I., N.Y.

Use postpaid card. Circle No. 349

WALLS TU-WAY BELT SANDER



Foil
1/3 h.p.
S. E. Motor

VERTICAL

At last, a top quality industrial sander that provides all the most wanted features — yet sells for so little. **\$89.95**

complete-with cord, plug, switch ready to use

Illustrated Literature on Request

A few desirable distributor territories still available.

WALLS SALES CORPORATION

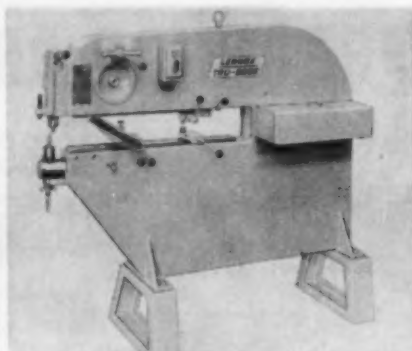
333 Nassau Avenue Brooklyn 22, N. Y.

Use postpaid card. Circle No. 350

Machine Cuts in Center of .150" Steel Plate Without Starting Hole

Model TE-150 is the newest addition of four models of Lennox Tru-Edge Metlmaster shearing, forming and piercing machines.

Outstanding feature reported for a machine of this size is that it cuts in the center of .150" mild steel plate (with no starting hole needed). Model has been designed to fit the needs of model shops, engineering labs and sheet-metal



Intermediate sized shearing, forming & piercing machine.

shops. It has an edge cutting capacity of 8 ga. in mild steel plate; 10-11 ga. in stainless steel, and 5 ga. in copper, and cuts to either a scribed line or to a template. The throat depth is 42" which permits circle cutting up to 40" in dia. inside the throat.

The machine operates with a reciprocating upper and stationary lower tool. It has an infinite range of tool strokes from .032" through .145", with strokes per minute (in relation to material thickness) being automatically regulated when setting stroke length. Maximum cutting speed is up to 36 fpm, with number of cuts per minute ranging from 1750 to 3500.

This model is priced at \$1,475.00 (f.o.b. factory).

Lennox Tool and Machine Builders, Dept. 147, Lima, Ohio.

Use postpaid card. Circle No. 93

MACHINE and TOOL BLUE BOOK



Model CLFC, with a second connection for cyclic oil delivery, contains a pump of the gear type (three pump gears).

Circulating Lubrication System Controls Rates Automatically

The Circulube fully automatic lubricating system continuously circulates clean, filtered lubricant through machine bearings at controlled rates. The system consists of a lubricator, a distribution system, and the control-units

which determine flow of oil to bearings. A pressure signal switch prevents machine operation until proper oil pressure has been developed. A level gage allows visual observation of oil level and drain plugs.

Three basic motor-driven models are available. Model CLFB has a two-gallon reservoir and a single outlet connection for continuous oil delivery. Model CLFC is similar to the CLFB model but is equipped with a second outlet connection from which oil is delivered cyclically in small controlled quantities. Model CLWB, with a single outlet connection, has a half gallon reservoir and is intended for small machines.

Bijur Lubricating Corp., Rochelle Park, N.J.

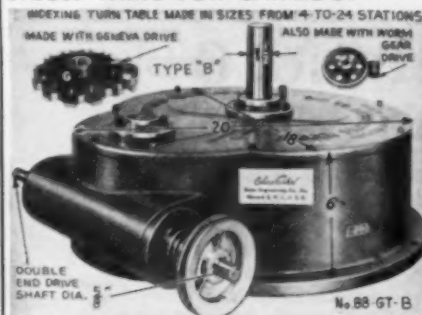
Use postpaid card. Circle No. 94

Counterbore Gives Burr-Free Chamfer On Holes

The self-contained ContourBurr is reported to do a consistent job of chamfering inside edges of tubing cross

INDEXING MACHINERY — CAMS — GENEVA GEARS — TURNTABLES

EISLER MAKES OVER 300 DIFFERENT TYPES OF INDEXING TURNTABLES SPECIAL MADE TO YOUR SPECS. WRITE FOR CATALOG.



Dr. Charles Eisler Me. Founder

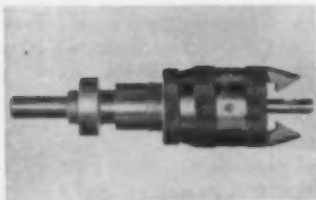
Charles Eisler, Jr. Pres.

EISLER ENGINEERING CO., INC.

762 SOUTH 13th STREET

NEWARK 3, NEW JERSEY

Use postpaid card. Circle No. 351



holes. A tapered collar slips over the tubing while the pilot passes through

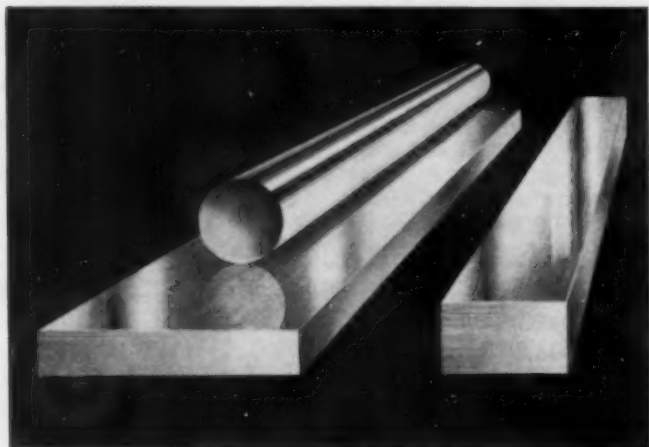
the hole. Bottoming of the tool forces the blade out of the pilot. A cam causes the blade to slide up and down so that it traces and shaves the internal edge of the cross hole.

The tool can be mounted in any available spindle, giving burr-free chamfer on holes up to $\frac{1}{2}$ of the tubing O.D.

Cogsdill Tool Products, Inc., 12980 W. 8 Mile Rd., Oak Park 37, Mich.

Use postpaid card. Circle No. 95

PRECISION GROUND IN THE SIZES YOU USE



Colonial No. 6 FLATS / SQUARES / DRILL ROD

First Quality oil hardening die steel, ready for design layout in over 700 sizes of flats and squares, 295 sizes of drill rod—in stock almost everywhere! Colonial No. 6 combines high toughness and wear resistance, is non-shrinking, easy to machine, completely free from decarb, and hardens in oil from low temperature. Write for Data Sheet!



Vanadium-Alloys Steel Company

LATROBE, PENNSYLVANIA

Use postpaid card. Circle No. 352

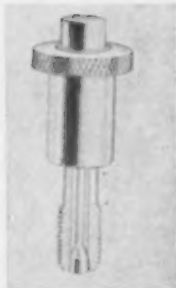
MACHINE and TOOL BLUE BOOK

Quick-Release Bolt

This fastener, for tension applications, combines the threaded advantages of a bolt with the features of a quick disconnect fastener. Bolts are engaged or disengaged by releasing or depressing a button that operates a spring-loaded mandrel. The mandrel maintains a positive locked-in contact between threads of tapped hole, or nut threads, with threads on quick-release bolt. Available in alloy or stainless steel, in 5/16", 3/8", and 1/2" sizes.

Avdel, Inc., 210 S. Victory Blvd., Burbank, Calif.

Use postpaid card. Circle No. 96



STYLE AND SIZES FOR ALL MACHINES ON WHICH THREADS ARE CUT

This die head is unique

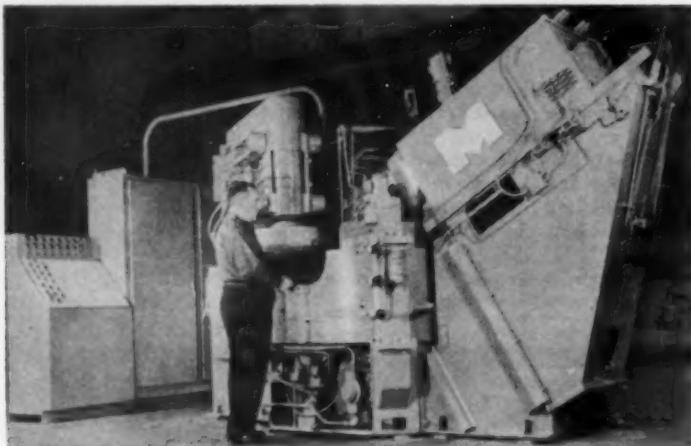
THERE IS NO OTHER LIKE IT

It cuts threads with insert chasers. These are, in reality, small sections of the business end of large and expensive chasers, but with this important difference: *their cost is so low they can be even thrown away when dull.* For example, for approximately \$50 you can get a dozen sets of insert chasers, each set ground ready to go. Change now to insert chaser die heads and watch your performance improve. "UNIFIED AND AMERICAN SCREW THREAD DIGEST" sent free on request.

THE EASTERN MACHINE SCREW CORP., 25-45 Barclay St., New Haven, Conn.

Use postpaid card. Circle No. 353

Packaged Grinding Heads Eliminate Column Ways



Packaged grinding head on this special four-station Mattison rough grinds head bearing sections for rock bits. Parallelogram head eliminates "play" and maintenance problems commonly developed in conventional tool slides.

Self-contained surface grinding heads with rocker-arm suspension may be mounted individually or arranged in groups to grind surfaces at any angle or in any plane. A toggle arm action, which forms a parallelogram design as it feeds a grinding wheel to the work surface, was demonstrated in motion at the Chicago Exposition by Mattison Machine Works.

Because column ways are eliminated, the packaged grinding heads are freed from maintenance problems caused by grit, chips, and lubrication. Completely sealed rocker arm journals have pre-loaded, tapered roller bearings which help the wheel produce fine finishes by eliminating play common in conventional tool slides.

Two basic parallelogram models—precision and foundry—are used for finish and rough grinding respectively. Precision models incorporate an hydraulic feed which works against adjustable lead screw stops. The hydraulic feed is arranged for both rapid approach and fine feed strokes, with controllable feed rates and adjustable limits. Two-way rapid traverse of the lead screw

and a variable increment jog infeed make the head ideally suited for automatic cycling and size control systems. Precision limit switches are included for control and interlock.

Foundry models feature variable grinding wheel pressure to 3000 lb. enabling the head to withdraw from the lead screw stop under excessive grinding loads without damage to wheel or spindle. A remotely operated variable increment feed also is provided for fine wheel setting and wheel wear compensation.

Tapered spindles on either of these heads fit a variety of wheel styles. An optional manifold feeds coolant from the wheel center for wet grinding.

Mattison is using parallelogram heads mounted vertically or at any angle on reciprocating or rotary grinders, as well as on straight-through and index-type machines. On horizontal grinders, the packaged heads move easily into position for face grinding.

Motor sizes range from 5 hp to 125 hp.

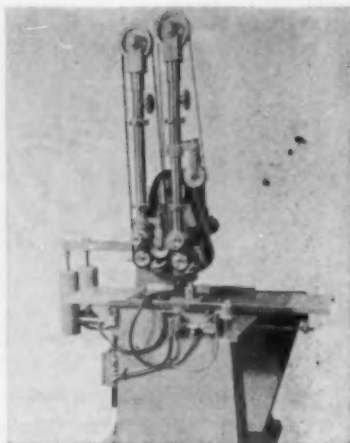
Mattison Machine Works, 545 Blackhawk Park Ave., Rockford, Ill.

Use postpaid card. Circle No. 97

Rise & Fall Abrasive Belt Grinder

This new Loungway rise and fall abrasive belt grinder is claimed to be the first grinder of its type to be able to rough grind and finish grind contour and form parts in one cycle in seconds, automatically. This machine comes with single or double-spindle assemblies, with the latter providing great versatility and speed. Other variations can be quickly adapted for handling special contours.

The double-spindle grinder allows two rough grindings and one finish grind in a cycle. Maximum workpiece size is 4"x6" long. Small pieces may be ganged for multiple grinding by using a workholding jig. Workpieces travel on a table operated by air motor and hydraulic check units, and a special cam enables speed indexing to each grinding position. A cam follower on the spindle assembly follows the rise and fall cam attached to the workholding fixture, which enables fast change-



over on jobs. The speed of each spindle is adjustable by using different drive pulleys, so proper speed can be set for grinding, finishing or buffing.

Eastern Machine Screw Corp., 60 Barclay St., New Haven 6, Conn.

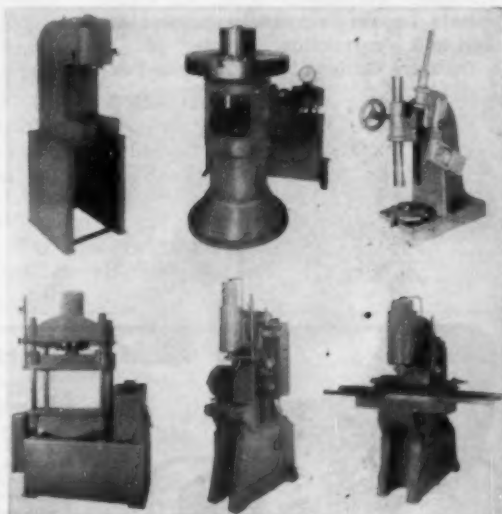
Use postpaid card. Circle No. 90

Pictured at the RIGHT!

... are the **GREENERD** Machines that were exhibited at the M. T. Exhibition in Chicago, Ill. Sept. 6-16

- Bench Type
 - Floor Model C-Clamp
 - Guided Platen Type
 - Straightening
 - Expanding
- (the above presses are hydraulic operated)
- Hand operated (illustration, lower right, shows only one of many types of arbor presses Greenerd manufacturers).

Write for Cat. M. T. E. Or Contact Your Local Dealer For Further Information.



GREENERD ARBOR PRESSES

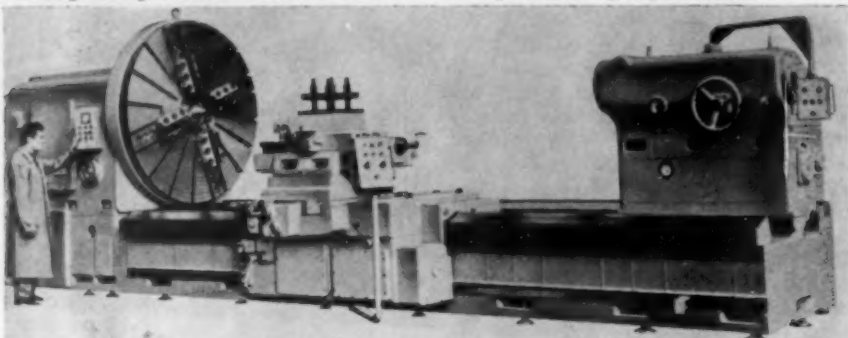
NASHUA

Est. 1883

NEW HAMPSHIRE

Use postpaid card. Circle No. 345

Heavy Duty Production Lathe For Every Turning Operation



Series offers three models with swings of 34", 38", and 43".

It is claimed there is no turning operation the new Morando Series PN heavy duty standard production lathe is incapable of performing. The series offers three models with swings of 34", 38", and 43". Center distances are optional on each model ranging from 60" up to 40'.

Rigidity is said to be absolute, with vibration eliminated even at fastest speeds by the extremely precise design and construction.

Beds are equipped with hardened and

ground slideways that are all inserted and replaceable. All three models feature a powerful heavy duty 50 hp motor.

Controls are simple and centrally located while lubrication is fully automatic.

This is one of five different series offered by Morando with swings available ranging from 19" up to 150".

S & S Machinery Co., 140 53rd St., Brooklyn 32, N.Y.

Use postpaid card. Circle No. 99



THREAD RING GAGE GUARDS protect "go" and "not go" ring thread gages. These Greenfield guards cushion the shock of accidental dropping or other rough contact which might change the gage setting and destroy its accuracy. Green for "go" and red for "not go" saves time and possible error with instant color identification. Available in nine sizes for gages with 1" to 5" O.D. Prices, \$25 to \$2.75 net. Geometric Tool Co., New Haven 15, Conn.

Use postpaid card. Circle No. 100



IN 11 SIZES—No. 6 to 1"
N.C. In all S.A.E. sizes.



*You Need an Extra Hand Now
to Speed Up Production!*

HEIMANN TRANSFER SCREW SETS

Here is the faster, more precise way of transferring open and blind screw holes—make savings in "wage-dollars-per hour" of your expensive hands on every job. A die-and-tool maker's tool with many other applications for die makers and machinists. A set of 6 Hardened Screws nested in combination holder and wrench—no other tools needed. Get more work now—save money tool

HEIMANN MFG., CO. • URBANA, OHIO

Use postpaid card. Circle No. 335

Production Sawing Machine Doubles Cutting Rates

The compact, powerful Continental production saw, reported to double cutting rates, has a horizontal cutting head and cuts with the top saw band. The resulting compactness permits use of new 2" wide tungsten carbide-tipped saw bands for faster cut-off work, a 10 hp drive, and 16" x 20" capacity, yet floor space and weight are small.

The vise arrangement and electrical programming of the index cycle enable the machine to crop ends of long bars



Saw teams well with DoAll's new 2" super blades for production cut-off.

without turning them and to use full bars, leaving virtually no stub ends.

Micrometer stock index adjustment, graduated in thousandths, can be set quickly for any length from 0" to 24". For longer lengths, multiple indexes can be used.

Other new features include automatic chip disposal, overhead mounting of main and outboard vises, servo regulated cutting rate, planetary chip brush, and standardized worktables.

The DoAll Co., Des Plaines, Ill.

Use postpaid card. Circle No. 98

NOW! A New APPROACH TO RADIUS DRESSING OF GRINDING WHEELS WITH **MICRAD** RADIUS DRESSING TOOL



Here is a dressing tool which will accurately and economically shave into a grinding wheel, those small radii (.007 to .125") which are always difficult and sometimes impossible to obtain with conventional diamond dressing tools. Full and even past center radii can be dressed into the face or corner of the wheel down to the smallest sizes. The MICRAD RADIUS DRESSING TOOL is equally effective on all types of grinding wheels or metal laps. Write today for literature. Price—Holder only \$12.50. Complete set of Holder and five T-C Radius Tools \$23.95

HENNIG TOOL PRODUCTS CO.

652 W. 134th St.

Chicago 27, Illinois

Use postpaid card. Circle No. 423

131



the latest
completely
illustrated

Free

CATALOG
No. 207

A complete line of vises
and rotary tables for produc-
tion, tooling and maintenance.

68 different models and types.
Vise jaw sizes from 1½" to 8".

Chicago Tool and Engineering Co.
8384 South Chicago Ave.
Chicago 17, Ill.

Use postpaid card. Circle No. 356

Wesson Extends Tool-Cartridge System For Throwaway Inserts

As a result of the success of Wesson's interchangeable cartridge system with throw-away inserts for special tools, the Wesson Co. has now standardized interchangeable cartridges in five basic styles and has made them available to users and tool manufacturers.

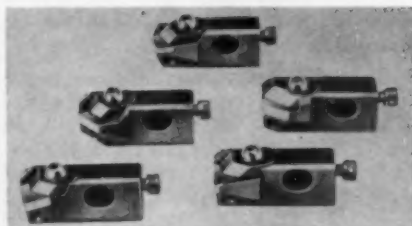
The system increases flexibility of tooling by simplifying design and use of combination tools to perform multiple operations (such as multiple boring, facing, counterboring, etc., with the same tool or multiple turning operations with one tool block). Also, the cartridges are salvageable and can be used in new tool designs when and if the original tools for which they were used are no longer needed.

Individual cartridges can be adjusted axially and radially for proper location, and to quickly establish correct relationship among dimensions produced by a combination tool. Throwaway carbide inserts of special and standard grades to suit all metalworking needs can be used in these cartridges.

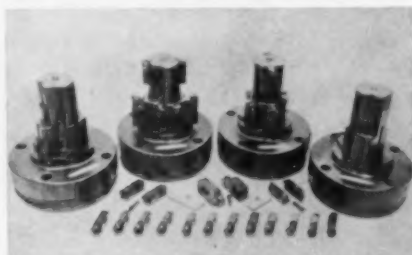
Inventory needs are minimized because only a few styles of cartridges, and even fewer insert styles, are used on any one tool.

BS-100 cartridges use square carbide throwaway inserts for facing and through boring. BT-200 cartridges use triangular inserts for boring or facing to a 90° shoulder and plunge facing. BT-300 cartridges use triangular inserts for 45° chamfering, through boring, or boring to a 45° shoulder. BT-400 cartridges use triangular inserts for 30° chamfering or out facing. BP-500 cartridges use pentagonal inserts for through boring.

All but BP-500 cartridges are available in right- or left-hand styles of either positive or negative rake. The BP-500 cartridges are available with negative rake only in either right- or left-hand styles.



Negative-rake, right-hand styles of each of the five basic cartridges are shown. The pentagonal-insert cartridge is at the top and the square-insert cartridge is at the lower left.



Typical combination quill made up of a number of Wesson throwaway insert cartridges. Individual cartridges are adjustable axially and radially. This tool bores, counterbores, faces, and chamfers track roller rims in one operation. Eight different size parts can be cut with the same set of cartridges after adjustments are made.

Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

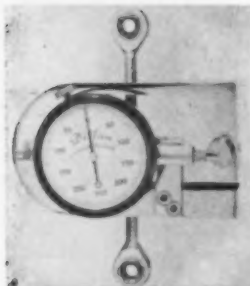
Use postpaid card. Circle No. 101

Push-Pull Gauge

This versatile new Dillon instrument does the work of two separate compression and tensile measuring devices. The unique split-dial gives readings of compression loads and tensile loads. Also, it can be hooked into a system to measure and control oscillating loads in compression and tensile.

Applications for this unit are found wherever pressure, tensile, or torque loads are to be measured.

Dillon's Push-Pull (Compression-Tensile) Gauges are individually cali-



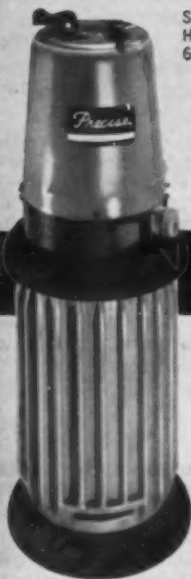
brated in capacities of 5-0-5, 12.5-0-12.5, 25-0-25, 50-0-50, 125-0-125, 500-0-500, 1250-0-1250, 2500-0-2500, 5000-0-5000, 12,500-0-12,500, and 25,000-0-25,000 lbs. Accuracy is reported as guaranteed to within $1\% \pm$ of full scale reading.

All units, either split dial push-pull types or specific compression or tensile instruments, can be supplied with micro switches as optional features.

W. C. Dillon & Co., Inc., 14620 Keswick St., Van Nuys, Calif.

Use postpaid card. Circle No. 102

COMPACT! PORTABLE! 4 SPEEDS!



SUPER CYCLE POWER QUILLS
High frequency power—7,200 rpm to 60,000 rpm with power up to 2 hp.

Precise



NEW SUPER CYCLE POWER CONVERTERS

Here's compact design, portability to match Precise Super Cycle Power Quills. New Power Converters are self-contained—no special wiring required. Just plug in and operate. Two switches provide an option of four frequencies, give you speeds from 7,200 rpm to 60,000 rpm and maintain them under load! You select the right speed to match material, cutting tool and production. Single speed, 4-speed and continuously variable models are available . . . drive from 1 to 30 power quills. Low cost, virtually maintenance-free.

Precise

Grinder-Millers, Power Quills, jig Grinders,
Milling Machines, Automatic Drill Units,
Cutting Tools, Vapor-Lub Cooling,
Sklero Hardness Tester
Quality and Precision Since 1882

PRECISE PRODUCTS CORPORATION

3731 Blue River Road, Racine, Wisconsin, U. S. A.

Branch Plant: Precise, G. m. b. H., Duesseldorf, Germany

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40,000 Lb. Capacity Tensile Testing Machine

Compact, hydraulically operated tensile testing machines have capacities up to 40,000-lb. Simple controls are conveniently mounted on the front of the base to insure ease of operation.

Stroke of the testers is 4", and specimens up to 10" long by 2" wide can be accommodated. To compensate for various specimen lengths, the lower jaw holder can be inserted in any of three pairs of slots in the side rails. Different size and style jaws can easily be inserted or removed from the wedge-type jaw holders. One set of standard jaws, either flat or round, is furnished with each tester. Standard jaw capacities are 0" to $\frac{3}{8}$ " or $\frac{3}{8}$ " to $\frac{1}{2}$ " for flat specimens; and $\frac{1}{8}$ " to $\frac{1}{4}$ ", $\frac{1}{4}$ " to $\frac{1}{2}$ ", or $\frac{1}{2}$ " to $\frac{3}{4}$ " for round specimens.

The machines are available with either one or two load gages. Testers with a single load gage are designated Model TE-40, and those with twin gages, as illustrated, Model TE-40-A.

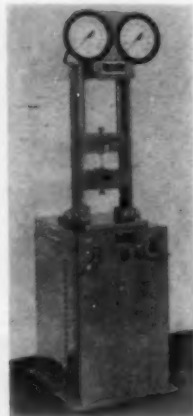
New Attachment Speedily Makes Tracing Templates

Tracing templates can be cut directly from the drawing with the new Mimik



Templator, with only 15 to 45 minute template time required. While designed primarily for use with the Mimik Tracer, it will also cut templates for certain other tracing equipment.

The unit, attached to any vertical



On the twin-gage machines, a gage selector valve is provided with the hydraulic controls, and both gages are protected against overloading.

Standard Model TE-40 is priced at \$3475., f.o.b. Detroit.

Steel City Testing Machines, Inc.,
8817 Lyndon Ave., Detroit 38.

Use postpaid card. Circle No. 103

mill, uses .003" shim stock and is sandwiched between two pieces of plastic to provide stiffness.

Dial settings on the unit provide for any angle or radius and straight x and y dimensions are taken from the machine tool table.

Mimik Tracers Inc., 3901 Union St., Buffalo, N.Y.

Use postpaid card. Circle No. 104

G-E Metallurgical Products Has Improved Carboloy Grade

Higher quality and hardness and greater wear resistance are characteristics claimed for the improved Carboloy 78B cemented carbide grade recently announced. All standard tool products in grade 78 and 78B are offered at a reduction of 25% in standard unground metal base price, a saving in initial tool costs.

The new material is designed to do a better job at less cost on many of the ordinary steel cutting operations, but

the Series 300 grades are still desirable for premium performance.

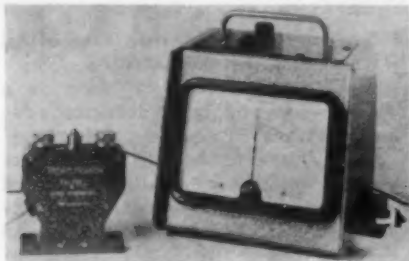
Carbology 78B is available in a full line of utility and precision pre-honed disposable inserts and in brazed tooling. The line also includes most standard blanks from 0000 to 7000 styles. Special shapes and sizes are available.

General Electric Co., Metallurgical Products Dept., Detroit 32, Mich.

Use postpaid card. Circle No. 105

Improved Inspection Equipment

The improved compact Talyvel automatic level, with variable sensitivity



Talyvel automatic level.

one to 20 seconds, was one of the new, improved instruments shown at the Production Engineering Show in Chicago, Sept. 6-16.



Micro-alignment telescope (auto-collimating).

The new micro-alignment telescope, also demonstrated, is auto-collimating and direct reading to .0002", with projection and camera attachments provided.

Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill.

Use postpaid card. Circle No. 106

LABOR SAVING Production CHUCK

Will pay for itself in 60 to 90 days

On turrets, engine lathes, cutting-off machines, drill presses or any type of chucking machine, the Barker Two-Jaw or Three-Jaw hand operated chuck will increase production up to one third and actually pay for itself while doing it in from 60 to 90 days.

Hand lever eliminates pneumatic and hydraulic systems, yet closes and locks jaws with lathe running or stopped. Over 30 years of labor saving, production boosting operation.



Top jaws open

Hand lever closes and locks while lathe is running.



Jaws locked

Write for bulletin 201 today.

CHUCK DIVISION

THOMAS HOIST CO.

245. HOYNE • CHICAGO 12, ILL.

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GARLAND SPLIT HEAD HAMMERS



No matter what face you favor, Garland nylon or rawhide are interchangeable in split seconds. Just turn'n change! Turn nut under head, insert new faces, screw back nut and you have a new hammer.

Garland hammers are wonderful for precision striking. No "bounce-back"! Safe! More blow durability!

Send for complete details of the world's widest selection of precision hammers and mallets . . .

GARLAND MFG. CO. 70 Water St.
Saco, Maine

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THREAD CUTTING TOOL



Provided with a scale for angular setting.

Circular Cutter, in high speed or carbide, has a negative profile and machines both thread flanks simultaneously. Thread cutting discs for all threads are available for both external and internal tool holders.

ACME TOOL CORP.

71 West Broadway, New York 7, N. Y.

Use postpaid card. Circle No. 360

K Cut Cutting Costs **KELLER POWER HACK SAWS** 5 SIZES . . . 10 MODELS



MODEL

3CH

WET

CUT

6 3/4"

X

6 3/4"



\$466.00
F.O.B.
Eau Claire, Wis.

CONTROLLED FEED PRESSURE, 40 to 170 lbs., two speeds and automatic lift on return stroke gives you faster cutting, longer blade life, Rugged, Oilite bearings throughout, 45° swivel vise and other features. Ask your Industrial Distributor about KELLER Power

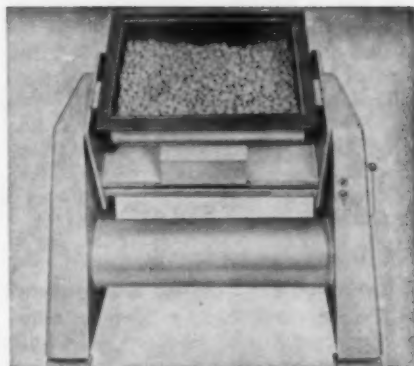
Hacksaws or write for Bulletin 380 with prices.

KELLER DIV.

Sales Service Mfg. Co.

2361 University Ave. St. Paul 14B, Minnesota

Use postpaid card. Circle No. 426



Vibrator For Maximum Tumbling With Minimum Movement

The Vibradyne can be used as a vibrator for mixing, pulverizing, deburring, descaling, cleaning and screening, grading stones, or for surface refinement of any metal parts. This design concept enables maximum tumbling with minimum movement and current consumption. The manufacturer also states that 100% of the media is vibrated in the tub, with negligible vibration transmitted to the base itself. Thus, no bolting down of equipment is needed, affording ready movement from place to place.

Provisions are made for obtaining various degrees of flow of parts and for varying the amplitude of vibration.

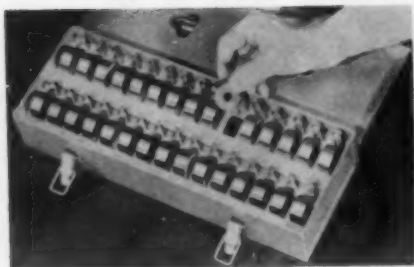
Downtime of the equipment is kept at a minimum, since there is no need to change belts or pulleys, or to start/stop or reverse motors.

Stevenson Co., Wellsville, Ohio.

Use postpaid card. Circle No. 167

Punch and Die Sets

Two standard assortments of Di-Acro punches and dies, called Punch-Paks, are available at an approximate 10% saving in price over purchasing the units individually, with the chest as a bonus. These punches and dies can be used in all hand and power operated punch presses as adapters are also available.



Di-Acro Punch-Pak No. 1.

No. 1 set contains 30 sizes of round punches and dies from $3/64"$ to $1/2"$ in increments of $1/64"$. Cost is \$139.50 f.o.b. factory. No. 2 set contains round punches and dies from $1/16"$ to $1/2"$ in $1/16"$ increments, round sizes from $1/2"$ to $2"$ in $1/8"$ increments, squares in $1/2"$, $5/8"$, $3/4"$, and $1"$ sizes, one die holder and two die adapters. Cost is \$259.50 f.o.b. factory.

O'Neil-Irwin Mfg. Co., 562 Eighth Ave., Lake City, Minn.

Use postpaid card. Circle No. 108

Why put a file
in a fire?



To toughen it so that it will cut faster and easier . . . and last longer. Of course, you can't "just put a file in a fire" and hope for the best. To give your file the properties you want, you must give the steel carefully controlled scientific heat treatment in a molten lead bath. You have to bring it to just the right temperature . . . keep it there just the right amount of time . . . and temper it to just the right degree of hardness. This is the way you make a rugged, dependable file. This is the way Clemson Star "Copper Tang" Files are made.

Newest addition to the quality line of Clemson Star metal cutting tools, "Copper Tang" Files are individually checked and tested before being released from the factory. Check as many as you choose. You'll never find a defect.

For information, contact your local Clemson Star Authorized Distributor. He'll gladly give you all details on new "Copper Tang" Files . . . and the other outstanding Clemson Star metal cutting tools. Call him today.

2331



CLEMSON STAR

CLEMSON BROS., INC. • Middletown, N.Y. • METAL CUTTING PRODUCTS

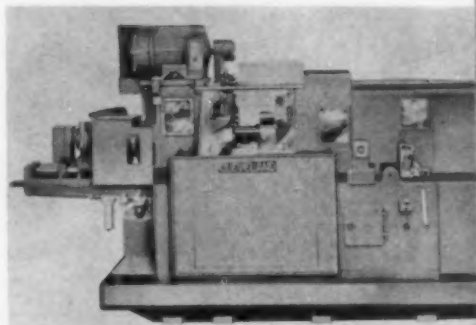
POWER HACK SAW BLADES • HAND HACK SAW BLADES • HACK SAW FRAMES
BAND SAW BLADES • HOLE SAWS • FILES • CLEMSON HAND POWERS

Use postpaid card. Circle No. 361

Design Changes Made In Cleveland 2½" Automatic

One of the design changes incorporated in the Cleveland 2½" Model AW single spindle automatic is a completely new type of feed bracket. This automatic obtains variable forward and return turret feeds through an improved, simplified mechanical drive, incorporating an air-operated disc-type friction feed clutch. An independent motor furnishes the power. Changes in feed are automatically controlled by adjustable steel cams mounted on the periphery of the regulating wheel. Adjustable trip pins govern the length of feed for each tool and make possible the return of the turret in idle motion when return feeds are not required.

The model has 40 spindle speeds ranging from 69 to 1920 rpm, and four automatic changes, both forward and reverse, are made available through an automatic air-operated clutch.



A completely new type of feed bracket is incorporated in automatic.

A five-hole, 11½" dia. tool turret, having a 9" tool circle, using Geneva indexing mechanism, is provided. Universal camming controls turret motion, cross slides, and cutoff attachment.

The Cleveland Automatic Machine Co., Cincinnati 12, Ohio.

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ACCURATE! • RUGGED! • RELIABLE!

Specify **nirol**

Spring Loaded LIVE CENTERS

CHECK THESE OUTSTANDING FEATURES:

- Automatically operated take-up for work expansion.
- Minimum overhang. Reduces vibration.
- High radial and thrust load rating.
- Easily accessible for lubrication with any spindle oil.
- All working parts hardened and ground
- Interchangeable Ball heads. 60° female or special.



Many other exclusive features. Get the complete story, including sizes, tapers and prices by writing to:

nirol MANUFACTURING CO

901 Highway 22, No. Plainfield, N. J.

Reg. U. S. Pat. Off.

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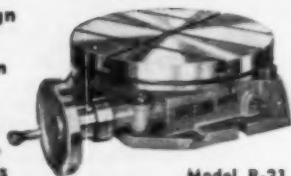
TROYKE ROTARY TABLES

New Design

Greater
Precision

Greater
Rigidity

6 Sizes •
8 Models



Model R-21

Guaranteed 60 seconds or less total accumulative angular error. (60 seconds equals .00087" at 6" diameter.)

• • •

Write for FREE Catalog Number 23.



TROYKE MFG. CO.

11290 Orchard Street
Cincinnati 41 (Sharonville), Ohio

Use postpaid card. Circle No. 363

MACHINE and TOOL BLUE BOOK

NEW LOW COST LEAD SCREW TAPPER



with...

**PUSH
BUTTON**
operating
control

- Produces Gauge Perfect Parts
- Eliminates parts spoilage, inspection
- Saves Taps, Reduces Fixture Costs
- Fast, Economical, 6-way Operation

Here is truly the most accurate, most precise, cost-cutting tapper on the market! New, different, flexible, it can be operated with push button and foot control for cycle or jog, automatic or with switch in fixture for full cycle. Either way, it provides a uniformity, speed and precision accuracy that's unparalleled!

Here are just a few features:

- uniform threads in any pitch from 20 to 96.
- positive depth stop.
- depth stop hold uniform depth to within .003"
- tap capacity 0" to 3/16" in steel.
- lead screw travel 1-3/16".
- "safety return" stops tapping instantly.

Easy to Operate — Pays for itself

Push button releases electrically controlled air pressure engaging sensitive friction clutch which actuates lead screw. The tap, completely controlled by lead screw, is fed gently, automatically

without pressure. The result is repetitive uniformity and precision that never varies! Tests proved all tapped parts passed 100% inspection—without rejects!

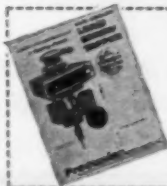
Procunier

Send for FREE Brochure

giving the full story of this amazing new tapping unit. See how you can enjoy higher quality tapping, less tap breakage, parts spoilage and increase tapping efficiency—for less cost! Write today!

**PROCUNIER
SAFETY CHUCK CO.**

14 S. Clinton St., Chicago, Ill.



PROCUNIER SAFETY CHUCK CO., Dept. 11
14 S. Clinton St., Chicago, Ill.
Gentlemen: Please rush me your **FREE**
brochure on the new Lead Screw Tapping
Attachment.

NAME _____

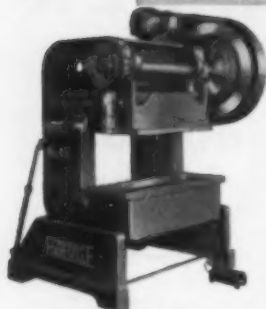
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CITY _____

STATE _____

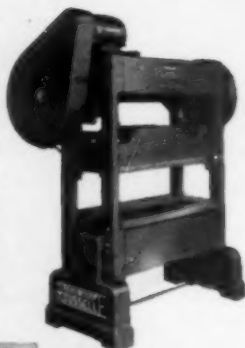
High-Output with **ROUSSELLE**

DOUBLE-CRANK PRESSES



No. 4B OBI with "Econo-Air" clutch.

SPEED UP PRODUCTION with these versatile 40-ton presses. Large bed and ram areas make them ideally suited to handle wide rolls or sheets . . . do multiple punching, steel-rule die work and other high output operations. For rapid, shockless starting and stopping, presses can be equipped with electrically controlled "Econo-Air" friction clutch . . . Ask for new catalog.



Choice of over 30 models and types, in 5 to 60-ton sizes



STRAIGHT SIDE - Die space up to 24 in.; bed space up to 6 ft. between uprights.

SERVICE MACHINE COMPANY

Mfrs. of Roussele Presses

2310 WEST 78TH STREET • CHICAGO 20, ILLINOIS

Roussele Presses are sold exclusively through Leading Machinery Dealers.

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complete
broaching
service

plus...

Conant offers complete engineering and manufacturing facilities for your broaching needs. Expertly designed for proper strength and chip carrying capacity. Prompt broach sharpening and reconditioning service. Order standard keyway broaches from our stock.

Your inquiry invited. Send us part prints for recommendation and quotation.

CONANT BROACH COMPANY

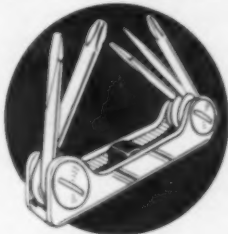
13747 S. Western Ave., Blue Island (Chicago Suburb) Ill.

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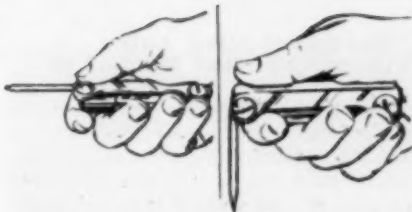


New Compact Screwdriver Set

The No. 45 Fold Uni Drive is a new combination tool with five screwdrivers



which fold into the handle like a pocketknife. The screwdrivers include two flat blades, two Phillips type blades,



and a handy point awl. Each blade can be used straight out or at right angles for extra leverage.

This high quality tool steel set is priced at \$1.69 each.

Ekland Tool & Mfg. Co., 2627 N. Western Ave., Chicago 47, Ill.

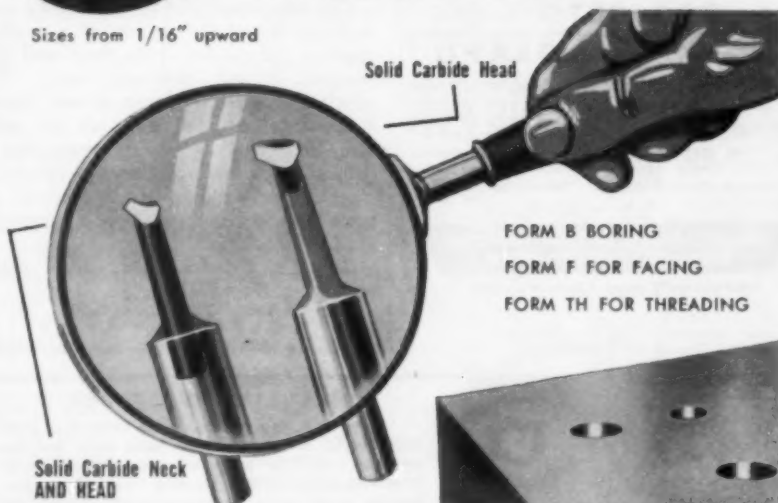
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INTERNAL CUTTING TOOLS In "CARBIDE"

FOR SMALL INTRICATE INTERNAL CUTTING,
WE OFFER THREE PRACTICAL FORMS
WITH PRECISION GROUND HELICAL AND SPIRAL RELIEF DESIGN.

Sizes from 1/16" upward



Please write for complete catalog.

R. B. TOOL CO., INC.
340 Maple Avenue • Westbury, L. I., N. Y.

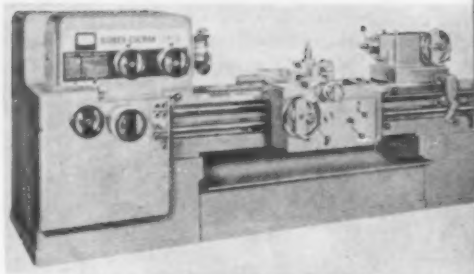
Use postpaid card. Circle No. 463

Tracer-Controlled Lathe Speeds Precision Machining

Barber-Colman No. 2013T tracer-controlled lathe combines 66 thread and feed changes, feed range from .0015" to .091" per revolution of spindle, automatic threading stops, and up to 40 hp through the spindle to speed precision machining. The lathe offers spindle speeds up to 2000 rpm.

The geared head machine unites many qualities of a roughing lathe with the versatility, controls, and precision of a toolroom lathe.

Barber-Colman demonstrated the lathe with a quick-change, front-mounted hydraulic tracer at the Chicago Exposition. Only ten minutes are required to detach the tracer and replace it with the regular compound.



Precision, heavy-duty lathe has spindle speeds up to 2000 rpm.

The 36-speed machine is available in 20" and 25" swing capacities.

Barber-Colman Co., 593 Loomis St., Rockford, Ill.

Use postpaid card. Circle No. 114

PROJECTO GRAPH

OPTICAL MEASURING INSTRUMENT FOR INSPECTION OF COMPLICATED PARTS.

An optical comparator—unsurpassed for image contrast and accuracy—comes complete with single lens—10x to 100x—precision ground stage. From \$425. Accessories available.

Write for Catalog

PROJECTO-GRAPH INSTRUMENTS CORP.
ROCHESTER 1, NEW HAMPSHIRE

Use postpaid card. Circle No. 465

Reverse Driver For Quadrill Turret Drilling Heads

Chicago Quadrill Co. states they have now perfected the design of a positive reverse driver for their four and five position turret drilling heads. This newly designed reverse driver makes it possible to tap directly off any spindle. However, its use is restricted to drill presses equipped with a reversing motor. The drilling heads convert almost any drill press into a precision drilling machine.

Chicago Quadrill Co., 1846 Busse Highway, Des Plaines, Ill.

Use postpaid card. Circle No. 115

POWERFUL!

**Magne-
LIFT**

POSITIVE!
PROFITABLE!

QUICK-RELEASE MAGNETIC GRIP

Lightweight, easy to hold, makes handling of sheet metal, panels and plates easier, safer, faster and less expensive. Multiple permanent magnet and spacer assemblies are guaranteed to retain their lifting power. Capacity is adjustable for limiting weight of each lift, promoting worker safety. Magne-LIFT simplifies handling, lessens fatigue and cuts costs.

Write for catalog information and prices
CONCENTRIC TOOL CORPORATION Dept. B-1
2486 Huntington Drive • San Marino, Calif.

Use postpaid card. Circle No. 366

Improved Lighting For Plant Efficiency

With increased emphasis on safety engineering and maximum production in plant operation, the need for better lighting has been met by a new Rexlite flexible arm machine and bench light. Features reported by the manufacturer include U.L. approved wide-range adjustable swivel and universal mounting flange that fits any machine in the plant, and provides close, focused light for maximum visibility.

Standard fixture or custom-designed lighting, made to specifications, are available from the manufacturer.

Rex Electric Manufacturing Corp., 190 Berry St., Brooklyn 11, N.Y.

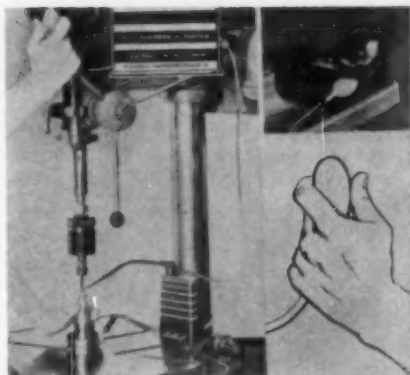
Use postpaid card. Circle No. 116

Dispenser Eliminates Cutting Fluid Waste

The Fluid-Miser was designed as a more efficient applicator for use with the new Tapmatic Dual-Action cutting fluids. Squeeze bulb for unit can be hand or foot operated. Purpose of the Fluid-Miser is to apply correct amount of fluid, by remote control, eliminate unnecessary waste and permit properly timed ejection at the work point.

Price is \$6.95 complete with one pint Tapmatic cutting fluid.

Tapmatic's Dual-Action cutting fluids combine both chilling and lubricating in a controlled time-cycle. Especially for tapping operations, the new fluids are also effective for reaming, parting, threading, and finishing. Improved



finish, longer tool life, and freedom from tool seizure and galling are some of the advantages claimed.

The No. 1 cutting fluid is especially compounded for use on steel and all other metals except aluminum; No. 2 is for use on aluminum only.

Tapmatic Corp., 845 W. 16th St., Costa Mesa, Calif.

Use postpaid card. Circle No. 117

This new MORRISON KEYSEATER can make money for you

Install it in your shop. Its low cost will amaze you. Watch it pay for itself. You can quickly eliminate costly production tie-ups caused by waiting for expensive outside services. This is not an ordinary keyseater.



The Morrison Keyseater is quality built with machine tool accuracy. Practically anyone can operate it. It has automatic feed, automatic stop to cut off feed at given depth, automatic relief to back the work away from cutters, automatic lubrication. NO BUSHINGS REQUIRED. Cuts keyways 1/16" to 1". FREE new catalog 714-A shows all features and specifications can be had by writing:

**THE D. C.
MORRISON CO.**

P.O. Box 1017C
Cincinnati 1, Ohio

Use postpaid card. Circle No. 425

AUTOMATIC INDEX TABLES



Continuous motion; skip indexing and uneven indexing available. Diameters from 16" to 80". Avey Division, Motch & Merryweather Cincinnati 1, Ohio



Use postpaid card. Circle No. 367

Dirty Coolant Cleaned In High Flow Rates By Filters

A new line of vacuum coolant filters designed to clean dirty coolant in high flow rates is available in five models with capacities from 150 to 1000 gpm. They perform two types of cleaning action. When dirty coolant enters the



tank, heavy particles settle to the bottom and are removed by a drag conveyor. The vacuum portion then cleans the coolant. Filtering is performed by a fabric that winds around a mesh drum, which is immersed in the dirty coolant tank. A vacuum pulls the coolant from the dirty coolant tank, through the fabric to the inside of the drum. The clean coolant is then pumped into the clean coolant tank.

For installations requiring a high degree of coolant clarity, an optional diatomaceous earth body feed may be added to the filter.

Filter capacities are 150, 250, 500, 750, and 1000 gpm with soluble oil.

Barnes Drill Co., 852 Chestnut St., Rockford, Ill.

Use postpaid card. Circle No. 118

School Size Shearing & Forming Machine

Vocational and trade schools, in instructing students, required a machine that was small and compact, yet one that had the capacity of larger machines to do all of the shearing and



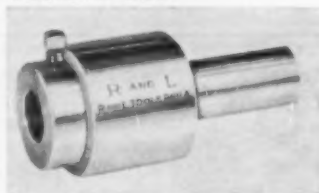
forming operations. The Model P-2, with cutting capacity of $\frac{1}{8}$ " in mild steel, solved the problem. Industry found it valuable also, as the machine is ideal for straight shearing, circle cutting, irregular cutting, slot cutting, inside cutting, beading, flanging, jogging, edge bending, dishing, or louver cutting. A single machine could do all these operations on steel up to $\frac{1}{8}$ " thick.

The machine operates with a stationary lower tool and a reciprocating upper tool that penetrates to the shearing point of metal and leaves a smooth edge that requires no further finishing. Larger models are capable of shearing mild steel up to $\frac{13}{32}$ " thick.

American Pullmax Co., Inc., 2455 N. Sheffield Ave., Chicago 14, Ill.

Use postpaid card. Circle No. 119

Tap and Die Holder—Six Tools in One



This is a tap holder, an acorn die holder, a right- and left-hand threading and tapping. This R & L six-in-one tool com-

bination features a releasing mechanism, and can easily be changed for either right- or left-hand threading and tapping. The clutch in the tap and die holder instantly locks into position as soon as tap or die engages the work.

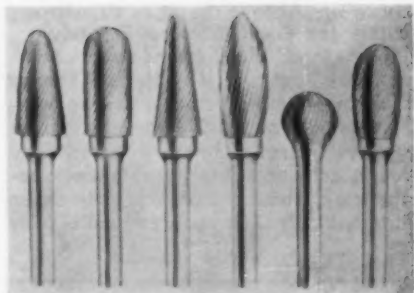
This same type of clutch mechanism is also featured in the firm's releasing die holders for acorn dies. There are also available R and L adapters for acorn and button dies which are precision made to fit perfectly with R and L tap and die holders. Shank sizes of holders range from $\frac{5}{8}$ " to $1\frac{1}{2}$ ".

R and L Tools, 1825 Bristol St., Philadelphia 40, Pa.

Use postpaid card. Circle No. 120

Tungsten Carbide Rotary Files Eliminate Dead Area At Index

The new Bi-Dex tungsten carbide rotary files are said to combine the best advantages of both sectional and center fluting, eliminating chatter and chip-clogging at the nose of the file. The important advantage reported is



Six representative shapes of the files.

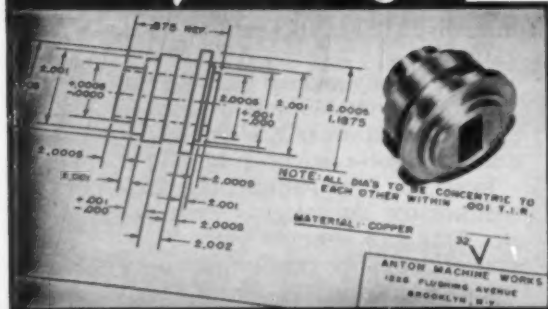
doing away with the cumbersome "dead area" encountered in the operation of the tungsten carbide rotary files with radius ends, providing effective cutting power over the entire surface of the file.

The files operate best at high or ultra high speeds but can also be used with slower power sources.

Grobet File Co. of America, Ltd., Carlstadt, N.J.

Use postpaid card. Circle No. 121

PRECISION MACHINING our Specialty!



The accuracy which is immediately apparent in the precision part shown, is typical of HUNDREDS of THOUSANDS of parts produced year after year in our plant.

A fully responsible source with unusual facilities for turning, milling of small intricate parts, and enviable performance record in this highly specialized field.

Anton
Machine Works
1226 Flushing Ave., Bklyn. 37, N. Y.

SEND DRAWINGS OF YOUR
DESIGN FOR QUOTATION

Use postpaid card. Circle No. 368

Tracing Attachment Is Equipped With Its Own Power Supply

Man-Au-Cycle Corp. of America announces a new self-contained tracing attachment equipped with its own complete electrical and hydraulic power supply system. The new attachment rough cuts and finishes in proper sequence, switching from rough to finish automatically. The cycle control is fully

automatic with rapid traverse on the return. With a special switch gear the machine is capable of making an unlimited number of passes.

The all-hydraulic tracer cuts in both directions and is capable of making a full $\frac{3}{4}$ " dia. reduction on a single pass. Its maximum tracing length is 30", its stroke 4".



Universal Right Angle Irons made to unusually high standards for squareness and parallelism. Heights from 5" to 16".



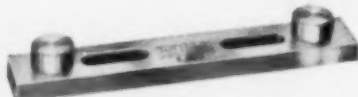
Toolmaker's Knee has all finished surfaces ground square and/or parallel to each other within .0001".



Standard and heavy duty precision V-Blocks with workholding capacities from 1 $\frac{3}{4}$ " to 6 $\frac{3}{4}$ " diameter.



Universal Squares feature precision lapped knife edges, square to within .00015" or better.



Sine Bars are made with overall accuracy in tenths and finer. Scientifically heat treated and precision ground. In 3", 5", 10" and 20" sizes.

PRECISION TOOLS FOR MASTER TOOLMAKERS

Taft-Peirce Production and Inspection Equipment gives the Master Toolmaker the one vital ingredient essential to his craftsmanship: "ACCURACY HE CAN TRUST."

You can buy and use Taft-Peirce tools with confidence, and rely on published manufacturing tolerances and job-tested design.

SEND FOR NEW PRODUCTION AND INSPECTION EQUIPMENT CATALOG NO. 511. AND SPECIFY TRUE PRECISION TOOLS BY TAFT-PEIRCE FOR YOUR TOOL ROOM.

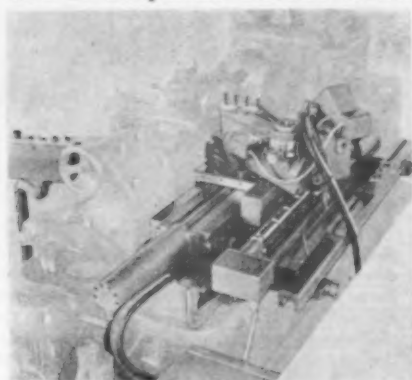
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WOONSOCKET, RHODE ISLAND

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Push-button controls are operated from an independent movable control



station. The machine is equipped to do matching profiles I.D. as it does O.D. through use of a dual adjustment template arm.

Man-Au-Cycle Corp. of America, Brooklyn 32, N.Y.

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Grinds Flutes

Model
90FS



AUTOMATICALLY

Makes twist drills, spiral or straight reamers, end mills, cutters, and other carbide tools from solids.

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sharpens
saws

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November, 1960

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SOCKET SCREW PRODUCTS

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**FASTER PRODUCTION
of PRECISION CAMS,
O-RING GROOVES
& hundreds of other
contoured parts**



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2 or 3 dimensional FLUID MOTION Duplicator Tables

Fastest Profile Milling and Duplicating

Save up to 50% and more machining time on contoured parts with both the R-200 and R-300 models. Single-lever control allows operators to duplicate complex parts in a fraction of the usual time.

R-200 — 2-Dimensional Profiler for any vertical miller

R-300 — 2- and 3- Dimensional for Bridgeport millers

Capacity: 6" x 6" (7" x 6" Special)
1 to 1 ratio with master

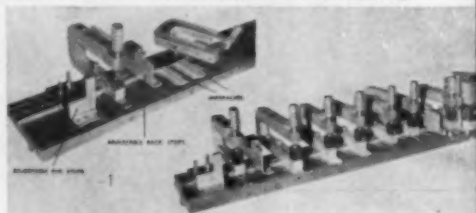
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J. M. KALINS & COMPANY

1575 Railroad Ave., Bridgeport, Conn.

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End Stops, Back Stops, Spacers For Hole Punching & Notching



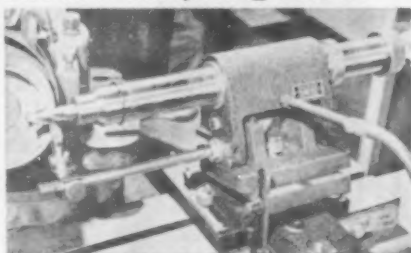
1—Unipunch adjustable end stop, adjustable back stop, two Unispacers for mounting lying down Unipunch hole punching units to press brake bed rail and one Unipunch hole punching unit mounted on Unispacer and bolted to T-slot in bed rail. 2—Complete setup of Unipunch hole punching units, adjustable end stops, adjustable back stops, and Unispacers on press brake bed rail.

Unipunch adjustable end stops, adjustable back stops, and Unispacers for hole punching and notching setups on press brake bed rails have been announced. The end stops, with built-in screw, are adjustable front-to-back in three positions. Back stops are combination stops and work supports. New Unispacers snap into the groove and slide along this groove for easy, accurate positioning of Unipunch hole punching and notching units.

Punch Products Corp., 370 Babcock St., Buffalo 6, N.Y.

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End-Mill Sharpening Fixture



Air bearing minimizes friction, permitting smooth grinding motion of the spindle.

The Weldon No. 7 combination end-mill sharpening fixture has the preci-

The spindle accommodates straight-shank end mills from 3/16" through 1 1/4" dia. by means of a matched bush.

A No. 7 AC air-conversion kit for existing Weldon end-mill sharpening fixtures is also offered.

The No. 7 combination fixture is priced at \$300; the No. 7 AC air-conversion kit, \$112.50.

The Weldon Tool Co., 3000 Woodhill Rd., Cleveland 4, Ohio.

Use postpaid card. Circle No. 127

Rotary Broaches Produce PERFECT HOLES

[illegible]

- A NEW INVENTION!
- A NEW MACHINING METHOD!
ROTARY BROACHING*
- A NEW NAME - "ROTARY BROACH"*

ROTARY BROACHES may be used in lathes, turret lathes, automatics, drill presses, etc., to replace reamers. They produce perfect holes with finishes that can only be compared to honing. They last longer before grinding is necessary and may be resharpened 10 to 30 times. They produce perfect holes at a fraction of the cost of those produced by other methods. Eliminates grinding, lapping, honing and boring.

USE THIS NEW MACHINING METHOD—ROTARY BROACHING*

* "Rotary Breach" & "Rotary Breaching" are new names coined & copyrighted by Shearcut Tool Co.

Patented in Canada, U.S. and Foreign Patents Pending © 1947

SHEARCUT TOOL COMPANY

7045 DARBY AVE., **BB-11** RESEDA, CALIFORNIA

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finish SQUARE HOLES in ONE PASS...



with *Minute Man*[®] SQUARE BROACHES

You can finish an *accurate* square hole in a drilled, reamed or cast bore in *one pass in less than one minute* with a Minute Man Square Broach.

Used in a hand-operated or hydraulic press, these High Speed Push Type broaches are ideal for putting square holes in boring bars, for jig, fixture and die work and for square coupling work.

They are available *from stock* in seventeen standard sizes from $\frac{1}{8}$ " square to $\frac{3}{4}$ " square.

The duMONT CORPORATION Greenfield, Mass.

MAIL FREE BROACH CATALOG AND
PRICE LIST T describing Square Broaches,
Hexagon Broaches, Production Type Key-
way Broaches and Keyway Broach Kits to

Name.....

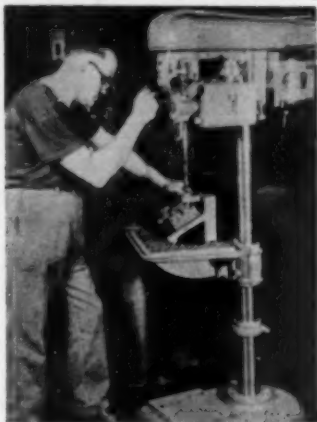
Company.....

Address.....

Use postpaid card. Circle No. 372

17" Drill Press Line

A new line of 17" drill presses is available with hand or power feed, in bench or floor models and in single or multiple spindles. A total of 76 models is offered, designed for both production and shop work. Any model may be



obtained with a $\frac{1}{2}$ " key chuck or No. 2 Morse taper spindle. Nominal capacity is $\frac{5}{8}$ " dia. holes in steel; $\frac{3}{4}$ " in cast iron.

The new drill press is reported as the first to provide an internal depth stop with long spindle travel—5". The internal stop mechanism is easily set with one hand in seconds, and is said to consistently repeat to the same depth and stay locked. The quick-set depth gage can be set from zero, regardless of height of the work, giving a direct reading as the drill penetrates.

Power feed models incorporate a completely new, up-front power feed that is operated with only one hand.

The new power feed also is available as an accessory for converting hand feed models to power feed.

Prices of the new drill press, furnished as a single spindle floor model with hand feed, start at \$268.00.

Delta Power Tool Div., Rockwell Manufacturing Co., 478 N. Lexington Ave., Pittsburgh 8, Pa.

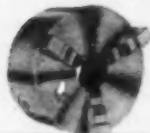
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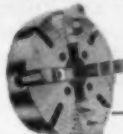
One of England's Finest LATHE CHUCKS

with average guaranteed accuracy of
.002" three inches from the jaw face

AND OTHER GREAT FEATURES INCLUDING: ONE PIECE BODY • FLAME HARDENED JAW WAYS • INDUCTION HARDENED SCROLL FORM • SUPPLIED COMPLETE WITH TWO SETS OF JAWS AND CHUCK WRENCH • CERTIFICATE SUPPLIED WITH EVERY CHUCK ATTESTING TO AND GUARANTEEING ACCURACY



3-JAW GEARED SCROLL



4-JAW INDEPENDENT

Size	Weight (lbs.)	Dia. of Bore	Price*
3-1/2"	6	5/8"	\$37.50
4-1/2"	6	1-1/8"	37.50
5-1/2"	11	1-1/2"	47.50
6-1/2"	16	1-11/16"	54.50
7-1/2"	26	2-1/4"	66.50
9"	38	2-3/4"	81.50
10-1/2"	68	3-1/2"	99.00
12"	106	3-7/8"	130.00

* All prices f.o.b.
warehouse, N.Y.C.

• Back Plates
available
at extra cost

Size	Weight (lbs.)	Dia. of Bore	Price*
4"	4	1"	\$27.00
6"	9	1-3/4"	31.50
4-1/2"	8	1-9/32"	27.00
6"	17	1-3/4"	33.50
8"	34	2-3/16"	56.50
10"	50	2-3/16"	74.50
12"	68	3-3/8"	88.00
14"	88	3-3/8"	101.00
16"	116	3-15/16"	119.00

In Stock: Direct mounting for American long taper spindle nose.

Direct mounting camlock fitting.

Spare parts for chucks also available

† Light Duty

ALL IN STOCK FOR IMMEDIATE DELIVERY

Write for complete new lathe chuck catalog

MANHATTAN SUPPLY CO., 151-A GRAND STREET, NEW YORK 13, N.Y. • CANAL 6-4992

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MAKE PRODUCTION TAPPING EASY!



The Commander Multi-Tapper permits tapping up to 8 holes and more at one time! You can make any drill press a production tapping tool in minutes. With one stroke of the drill press, you can tap multiple holes in any pattern. The Multi-Tapper fits any drill press; **SIMULTANEOUSLY HANDLES DIFFERENT TAP SIZES AND PITCHES!** It provides positive and instantaneous

spindle reversal to insure precise depth control for automatic or semi-automatic operation. The Multi-Tapper combines unequalled performance with tapping economy.

Ask your nearby Commander Distributor to show and demonstrate the unit. You'll see for yourself how this production tool can save you time and money.



Write for the
Production Tool
Catalog today.

Commander MFG. CO.

4227 WEST KINZIE

CHICAGO 24, ILLINOIS

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Machine Tool Dials

These machine tool dials are custom made, machine cut, and ready for use on present or special equipment. Illustrated at left is old standard type 1

for lathes, mills, shapers, etc. This dial can be furnished in steel or aluminum alloy with steel hub with any numbering or graduation.

Shown at right is loose ring type 2, made of aluminum alloy with steel hub or all steel. It has a brass adjusting screw for friction or positive locking.

Other types are shown in literature from the manufacturer, M-D Dials, 815 N. Cody Rd., LeClaire, Iowa.

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- Tells how to select Ideal Gold Band Live Centers to fill your needs *exactly*. Over 40 different sizes and styles in 4 models—**Universal, Multi-Duty, Heavy-Duty, Pipe Point**—custom quality performance at production prices.

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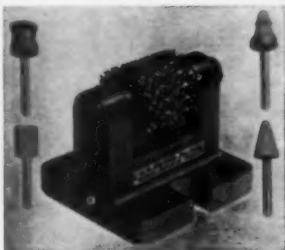
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Grinding Wheel Dresser For Mounted Points

A new grinding wheel dresser restores the shape and grinding action of worn, loaded, and out of shape abrasive mounted points. As illustrated, the worn mounted points at the top have been dressed to original shape as at the bottom. The revolving mounted point is held against the thin gauge star-type cutters for a few seconds until original shape is restored. The dresser base is 3" x 3 1/4" and may be bolted or screwed to a bench. Shipping weight is 2 1/2 lb.

Desmond-Stephan Mfg. Co., Urbana, Ohio.

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Dresser base is 3" x 3 1/4".

NEW! for tool and die makers Scribe-IT

MARSHALL'S TIME SAVING COMBINATION

in the most popular sizes of:

~~Oil~~ **GROUND FLAT STOCK**



18" and 36" lengths

Over-Size Specifications: Under 3/16" thickness, pre-colored standard sizes 3/16"

and over, Thickness plus .011" to .013" Width plus .010" to .015"

Ready for scribing and layout.

Method of pre-coloring does not change size.

Same price as Standard Flat Stock.

Resists rust.

Permanent identification.

Can be finished to Standard size after heat treatment.

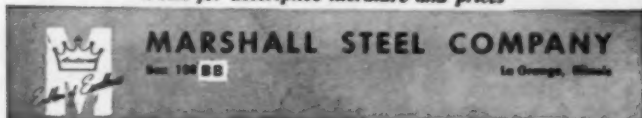
Retains 25 to 35 R.M.S. (Micro finish).

Protected fully and easily distinguished by new Scribe-IT aluminum foil packaging.

Available in practical range of sizes for tool and die making.

Pre-colored and Oversize but retains accuracy of dimensions.

Write for descriptive literature and prices



Use postpaid card. Circle No. 376



Machine Grinds 59° Drills On Sizes From 1/8" — 2 1/2" Dia.

Grinding 59° drills accurately with a free cutting conical form on all sizes from 1/8" to 2 1/2" diameter can be done quickly and easily on the new Model "DF" Sterling drill grinder. Because

no chucks or collets are required to hold the drills, it takes a minimum of time to change set-ups for various sizes. Locating the drill at the cutting edge of the lip being ground produces an accurately centered drill that holds hole size to close tolerance.

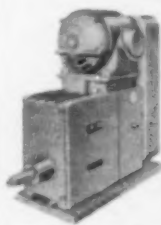
The true conical form produces the same clearance angle from web to O.D. making a fast cutting drill that enters the work easily and as a result produces more pieces per grind. The machine handles 3 and 4 lip drills as well as 2 lip drills.

The Model "DF" is powered by either a 1/2 or 1 h.p., 3450 r.p.m. motor and uses a 6" x 1 1/2" x 1/2" straight cup wheel with 4" x 1" recess. A built-on diamond wheel dresser is standard equipment.

McDonough Mfg. Co., Eau Claire, Wisconsin.

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DRILL FEED UNITS



for drilling, tapping, milling, boring, Cam, hydraulic, or lead screw. Many sizes, 1/2 to 15 hp. Avey Division, Motch & Merryweather Cincinnati 1, Ohio

Avey

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GEARS

In Stock—Immediate Delivery

Gears, speed reducers, sprockets, thrust bearings, flexible couplings, pulleys, etc. A complete line is carried in our Chicago stock. Can also quote on special gears of any kind. Send in your blueprints and inquiries.

Send for Complete Catalog No. 18a
CHICAGO GEAR WORKS
440-50 N. Oakley Blvd., Chicago 12, Ill.

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A Simple Formula for Solving Tooling Problems

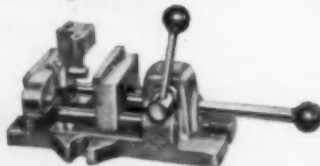
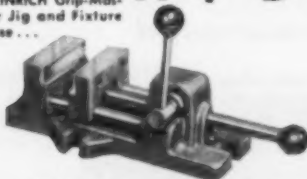
No need to start from scratch... use the HEINRICH Grip-Master Jig and Fixture base...

A + B

Simply add false jaws and bushing plate.

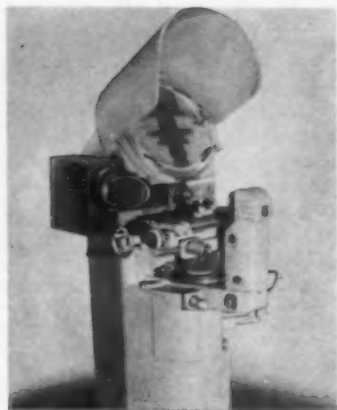
= C

Result...an accurate, low-cost Drill Jig.



HEINRICH TOOLS, Inc. Dept. 100-K Racine, Wis.

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Optical Comparator For Lateral, Vertical & Angle Measuring

Another new model of the J & L optical comparator, Model PC-14A, is designated as the economy model 14" screen universal measuring and comparison machine. The new model incorporates lateral, vertical, and angle measuring facilities.

Among other features designed for practicality, price, and performance are: direct reading measurements to .0001"; high intensity fan-cooled illuminating units; a full range of J & L Telecentric projection lenses from 5X to 125X; three table styles; and work capacity of either 5" or 8" in diameter with a maximum of 24" between centers.

Jones & Lamson Machine Co., Springfield, Vt.

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Creates Perfection"*

Comet. BORING TOOLS

(H. S. S. and Carbide) for Holes from 1/16" upward
Standard and Special Boring, Facing and
Internal Threading Tools. Write for Data.

Bore Small Holes? Contact **COMET**

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738-B-4 BROADWAY • NEW YORK 3, N. Y.

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November, 1960



**DECIMAL
REAMERS
and
Counter-
bores**

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Selections by the THOUSANDS
STYLES • DIMENSIONS
RANGES • SELECTABILITY
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WHY BUY SPECIALS?



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A CONTROLLED BLOW Saves TIME, EFFORT and MONEY

TAHLEN NO-BOUNCE HAMMERS

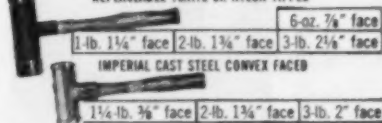
Prove, in your own plant, why this imitated, but never equalled hammer has saved millions of man-hours for its users.

Plastic tipped TAHLENS have all the advantages of lead hammers but none of their faults. No flying fragments, no distorted faces that cause misplaced blows.

And for fastening and drilling, Cast Steel TAHLENS with their high impact, replace mauls twice as heavy—save time and energy.

CONTROLLED BLOW PROFITS are yours with TAHLENS

REPLACEABLE TENITE OR NYLON TIPPED



Write for the Tahlen distributor in your area
Dept. M-11 **TAHLEN HAMMER CO.**
1729 1st South, Seattle 4, Washington

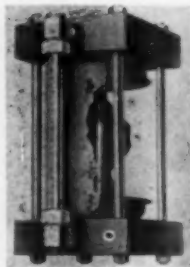
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253

New Baffle on Hydraulic Tank

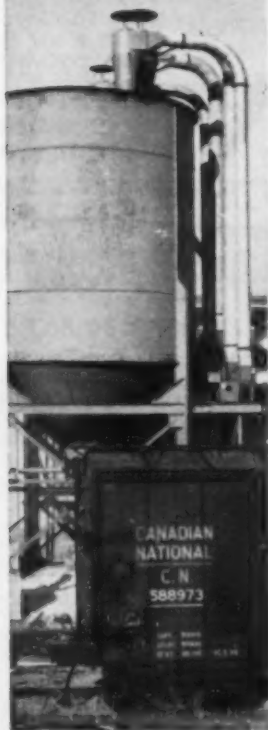
To eliminate fog often surrounding air exhausts of air-oil tanks used in booster-equipped cylinders or machines, The S-P Manufacturing Corp. is incorporating its new Power-Flo Baffle into its new air-oil tank design. The steel mesh bell-shaped baffle is said to permit oil or fluid to enter the tank or be discharged quickly without any turbulence, resulting in a smooth, laminar flow, eliminating fog. Another outstanding feature of S-P's new tank is its Tru-Level Sight Gage.

The S-P Manufacturing Corp., 30201 Aurora Rd., Cleveland 39, Ohio.



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"TORIT'S dust control system solved our housekeeping problem



That's the opinion of Mr. Robert Flaughter, plant engineer at Richards-Wilcox Mfg. Co., who recently installed a Torit flexible system for dust collection in their new woodworking department. Richards-Wilcox, in Aurora, Illinois, is one of the country's largest firedoor and partition door manufacturers.

Mr. Flaughter was also impressed with the other results of Torit's efficiency in removing up to 98% by weight of wood dust, chips, and shavings. "Employee morale was increased noticeably by cleanliness at the plant. Machine downtime is already lower. And the long range effect on the health of both men and machines is bound to be beneficial."

Four Torit centrifugal separators, models #30 and #36, were installed. The flexibility of the system allows individual machine shutoff. Also capacity of system can be increased approximately 25% with nominal cost.

Whatever your dust problem is, there's a Torit system to handle it, efficiently and economically. Your Torit representative can hardly wait to supply all the proof you want.

Just write to:

TORIT MANUFACTURING CO.

1133 Rankin Street, St. Paul 16, Minnesota, Dept. 626

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NOW!

for the FIRST time
HYDRAULIC FEED
on a 10" x 16" grinder

LOW COST
Micro-Precision,
High Speed Grinding

No. 17H
Priced at only
\$3580.⁰⁰

to give you the operating ease
and high speed of hy-
draulic feed for little
more than the cost of
a hand feed grinder.

For precision surface grinding
on tool room or production jobs,
you can't beat the Covet No. 17H.
The large grinding wheel with
plenty of direct power plus high
speed hydraulic feed and big cross-
feed capacity make it a real
money saver. Grinds approximately
twice as fast as with a comparable
hand feed machine.

First with hard chrome table ways...

Preserve original accuracy of hand-scraped
V and Flat tableways. Available at extra
cost on all Covet Surface Grinders.



Micro-Precision a Covet Tradition-Since 1874

COVEL **PRECISION**
GRINDERS
BENTON HARBOR, MICHIGAN

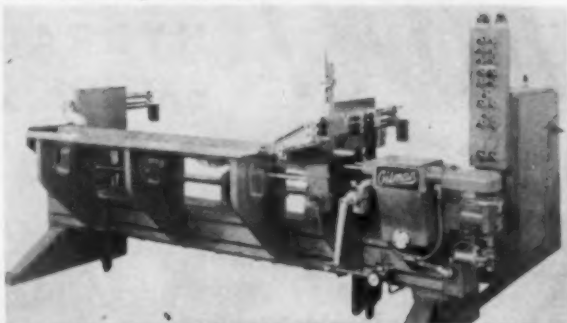
Write, wire or call us TODAY.
We'll gladly show you what
the Covet 17H can do for you.
Ask for Bulletin BB-110.

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Automatic Transferline Assembly Machines

Operating at a production rate of 2880 pieces per hour, a 16-station automatic Transferline assembly machine was demonstrated assembling six-piece Parker ball pen caps at the Production Engineering Show by the Gilman Engineering and Manufacturing Co., Janesville, Wis. This machine uses standard Gilman straight-line transfer and loading mechanisms throughout.

All stations are actuated by cams mounted on a single camshaft extending the length of the machine. "Building-block" station design permits modification of the line for model changes at about half the usual cost of retooling an automatic assembly machine.



Basic Transferline assembly machine consists of a standard drive, drive control, platen transfer unit, air counterweight control, and electrical system. Standard units of this type are available to customers who wish to tool their own machines.

A second 14-station Transferline machine shown illustrated the range of assembly operations possible using Gilman unitized patented station movements and other standard Gilman components and controls.

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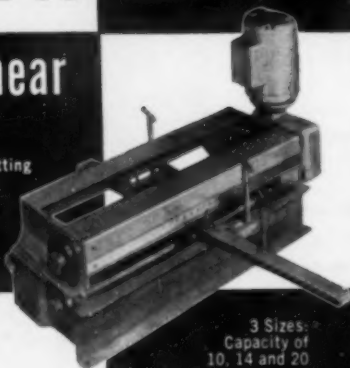
BEVERLY POWER

EFFICIENT
EASY TO USE

Slitting Shear

Designed to Provide:

- Fast, Clean Accurate Slitting
- Quick, Easy Set-ups to Desired Cutting Widths
- Enclosed Direct-Drive for Safe, Sure Cutting



3 Sizes
Capacity of
10, 14 and 20
ga. in mild steel

The extra-rigid, easily adjusted Back Gauge of the Beverly Power Slitter provides a positive stop and a solid base for the sheet as it moves through the machine. The Gauge can be quickly removed to leave the shear's deep throat open for front-hand slitting if desired. Spring-loaded Sheet Retaining Roller and channeled Back Gauge Slide Bar keep sheets in proper alignment for straight, accurate cutting.

Easy-to-read etched scales on either side of machine permit direct reading and quick setting to cutting width. Two reversible, interchangeable chrome cutters are direct-driven through steel shafts to assure safe, positive operation.

See your nearby
Beverly Distributor
Write for catalog sheet
and complete details.

BEVERLY SHEAR MANUFACTURING CO.

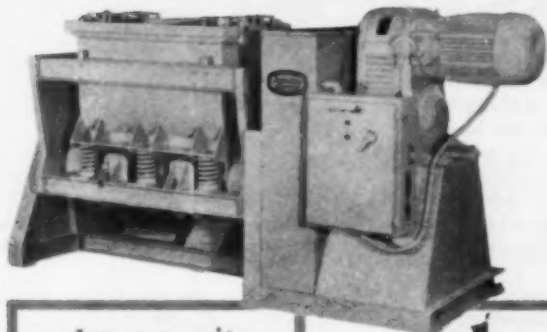
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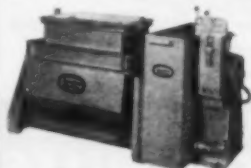
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VIBRASHEEN



ALMCO'S FULL LINE OF NEW VIBRASHEEN MACHINES

MODELS VT-717 — 712
(18 and 12 cu. ft. capacities)
Ideal for large components
requiring fixtures or a large
volume of smaller parts.



MODELS VT-77 — 75
(7 and 5 cu. ft. capacities)
Efficiently deburrs and
finishes parts in quantities
suitable for medium size pro-
duction runs.



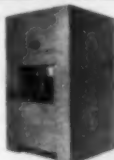
MODELS VT-72 — 71
(2½ and 1 cu. ft. capacities)
Popular unit for firms requir-
ing precise finishing of a wide
variety of parts in small lots.



MODEL VT-70
(¾ cu. ft. capacity)
Bench model ideally suited for
miniature bearings, extremely
small gears, stampings, etc.



ADVANCED DESIGN SERIES
Thirteen models are available
in this series featuring capac-
ities of from 5 to 40 cu. ft.,
each equipped with variable
speed drives. (Infinite from 6
to 30 rpm's.)



SPINDLE MACHINES
Designed for fast precision
finishing of complex, high
quality components such as
gears, bearing cages, spline
shafts, rotors, on continuous
production "in line" basis.



CUSTOM DESIGN BARRELS
Special large diameter barrels
are available to accom-
modate extra large parts. Fix-
tures hold parts to assure
complete, precise finishing of
all cavities and surfaces.

SEND FOR
NEW ALMCO
CATALOGS
ON MACHINES
MEDIA, AND
COMPOUNDS



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PRECISION FINISHING

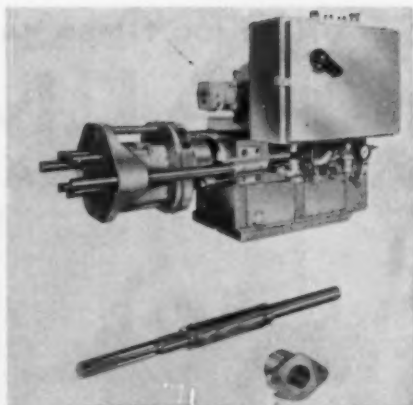
Queen Products Division • King-Seely Corporation
411 E. Main Street, Albert Lea, Minnesota

Automated Tapping Unit Has Single, Rugged "Lead Screw"

A new tapping unit uses the well-proved long-lived "lead screw" principle, so long basic to the engine lathe. Its main value is the economy of time and money in enabling pitch change with the one rugged lead screw, producing highly accurate threads. The use of a ruggedly durable "coarse pitch" ground Acme Thread lead screw and nut reduces the effect of wear and provides long life. Tapping pitch is changed by changing only one gear at the back of the unit.

The unit is completely self-contained and may be mounted in any position from vertical to horizontal. An oil pump provides circulating oil lubrication to all bearings and gears.

Complete automatic cycle, manual, or jogging operation may be obtained with standard controls. Maximum stroke is 5" with 3" rapid approach and 2" lead screw travel. All movements are adjust-



Unit illustrated has a four-spindle double eccentric adjustable tapping head attached.

able and may be correlated for automatic operation.

Thriftmaster Products Corp., 1048 N. Plum St., Lancaster, Pa.

Use postpaid card. Circle No. 140

KUTMORE ADJUSTABLE HOLLOW MILLS



A MIGHTY MIDGET!

This Midget Floating Holder Hollow Mill, flange type, has metric adjustment, and is designed to permit easy compensation for any spindle misalignment. Small, sturdy, extremely accurate!

Write for Catalog 20BB

It shows complete line of adjustable hollow mills. Our Engineering Dept. is at your disposal for special requirements.

CARL WIRTH & SON, INC.

1625 CLINTON AVE. NO. ROCHESTER 5 N.Y.

Use postpaid card. Circle No. 386

Machinery Mount Isolates Horizontal Machine Motion

The new Barry horizontal-force mount, Series RM, is designed for isolation of shock and vibration produced by machinery whose operation develops predominantly horizontal forces—cold headers, shapers, etc. Each mount handles up to 4000 lb. static load. One Barrymount is used under each machine foot or support point. Size is 10-5/16" x 8" over-all and 1 3/8" high.

Barry Wright Corp., 700 Pleasant St., Watertown, Mass.

Use postpaid card. Circle No. 141

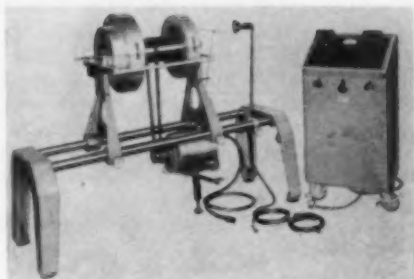


 <p>Severance ELECTRODE DRESSING CUTTERS</p> <p>Used by many to re-condition Electrodes without removing from machines—</p> <p>Down-time is Slashed!</p> <p>Production is Increased!</p> <p>Designed to fit most all popular Electrode Dresser power tools.</p> <p>Special shapes quickly made up.</p> <p>INVESTIGATE!</p> <p>It may pay you much!</p> <p>ASK FOR MORE INFORMATION TODAY!</p> 			<p>MIDGET MILLS</p> 
			<p>CHATTERLESS COUNTERSINKS</p> 
			<p>BALL SEAT REAMERS</p> 
			<p>CARBIDE END MILLS</p> 
<p>INSIDE DEBURRING CUTTERS</p> 	<p>OUTSIDE DEBURRING CUTTERS</p> 	<p>TUBE END DEBURRING CUTTERS</p> 	<p>CARBIDE HAND FILES</p> 
<p>HAND DEBURRING CUTTERS</p> 	<p>DISC CUTTERS</p> 	<p>DRILL COUNTERSINKS</p> 	<p>SPECIAL CUTTERS</p> 
<p>Severance TOOL INDUSTRIES INC.</p> <p>722 IOWA AVENUE</p> <p>SAGINAW, MICHIGAN</p>			<p>REGRINDING SERVICE</p> 

Use postpaid card. Circle No. 387

Dynamic Balancer Achieves New Heights of Accuracy

For greater accuracy in balancing equipment, the Model SU-7 dynamic balancer was designed by Micro Balancing, Inc., Garden City Park, N.Y. In its design, the manufacturer eliminated the erroneous effect of component vibration and substantially reduced the mass typical of conventional balancing ma-



chine frames. The sensitivity of the unit is 0.000, 01" of measurable unbalance displacement. Applicable to 95% of balancing requirements in industry, the unit will balance high-speed rotors weighing from 2 to 600 lb. Other types of rotary components it can balance are turbines, impellers, aircraft accessories, armatures, pulleys, and drums.

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Most Drilling Per Dollar! **Veet 3 foot RADIAL**



Features Found Only In Highest Priced Radials

Finger-Tip Clutching,
Automatic Drill Ejector
Push Button Elevation
Centralized Controls

Hardened Column & Way Inserts
Automatic Depth Control
Tapered Bearing Column & Spindle
Head Glides on Ball Bearing Rollers

Send for Brochure of Veet's 16 Points of superiority and name of nearest dealer, who will arrange actual demonstration of the Veet Radial, in your plant, without obligation.

**Mfrs. of the VEET High Pro '30'
SPEEDMILLER for Planer Conversion**

MADE BY **Veet INDUSTRIES** EAST DETROIT, MICH.
Tel. BRANCH 4-1000

Use postpaid card. Circle No. 391

MEL-O-FLO[®]
COOLANT AERATOR

**THOUSANDS
IN USE!**

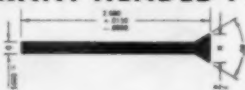
- STOPS SPLASH
- CUTS MAINTENANCE COSTS

Install one and be convinced!

Melard Products, Inc. 2926 White Plains Rd.
N.Y. 67, N.Y.

Use postpaid card. Circle No. 392

DURANT HEADED PINS



All tool steel Rockwell C 58/60 — honed finish, no pickup — heads left soft and are guaranteed uniform. Attractively priced at \$12. to \$19. per C. We manufacture 103 and stock 103 sizes for immediate delivery.

Available through our distributor or order direct.

Write for complete prices and details.

DURANT TOOL CO.
17 THURBERS AVENUE
PROVIDENCE 3, RHODE ISLAND

Use postpaid card. Circle No. 393

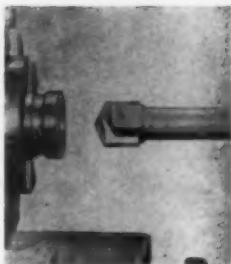
MACHINE and TOOL BLUE BOOK

Spade Drills Make Holes In One Pass

The spade drills are said to be capable of making holes in one pass from the solid, with no need for progressive drilling in deep holes. The spade drill forms a small C-shaped chip that can be easily flushed from the work. A wide range of bit sizes are interchangeable in a Madison tool holder. The drills can be used in a radial drill press, turret lathe, automatic, or similar types of shop equipment. It is unnecessary to remove the spade drill holder to re-grind, then replace and reset for depth. Cutters are simply replaced right on the machine.

Madison Ind., Inc., P.O. Box 1137, Providence.

Use postpaid card. Circle No. 143



Small C-shaped chips formed are easily flushed from work.

COMPARE

and you'll get a **BIG NEW**

J Johnson

model **J**

HEAVY DUTY METAL CUTTING HAND SAW



Capacity: 10' rounds, 18 flats • Motor—1/2 hp.
Any voltage available • Wheel Diameter—18 • Floor Space—46 x 31 • Bed—11 wide
44 long, 6 deep 24 high • Overall Height—25 • Weight—Approx. 750 lbs.
• Speeds—36, 90, 135, 190 feet per minute

COMPARE the handsome, husky Johnson Model J with any metal cutting saw and here's what you'll find:

- Johnson leads the way in dependable, well-engineered, high performance hand saws.
- A Johnson saw will cut anything in your stock pile, and do it faster.
- Johnson saws contain more exclusive construction and performance features that save time and money.
- Johnson saws are the finest metal cutting machines available anywhere—and, at the lowest price!

COMPARE . . . and see for yourself how easily you can save time, labor and production dollars with a Johnson saw. Complete information, prices— are yours for the asking.

Johnson MANUFACTURING CORPORATION
1012 Barnes St. Albion, Mich.
Use postpaid card. Circle No. 394



TOOL HOLDER. The new Microflex, for positive adjustment of finer finish cuts to .000050", is used on Hardinge second operation machines and chucking machines. It also holds boring tools on jig borers, screw machines, etc. A taper screw incorporated gives rigid support of tool and a clamping action which holds any setting without added locking mechanism. 00 size holds $\frac{1}{8}$ "- $\frac{3}{8}$ " round shank tools. Boring cap. is $1\frac{1}{4}$ " dia. Hardinge Bros., Elmira, N.Y.

Use postpaid card. Circle No. 144

High Accuracy Milling Machine

Extreme accuracy and sensitivity are features reported for the Micro-Hill

collet-type milling machine which applies to the instrument, electronic, missile, and other industries. It has Acme

M-B PNEUMATIC GRINDERS



Model M-CR-B



Model U-TR



Model HD-CR

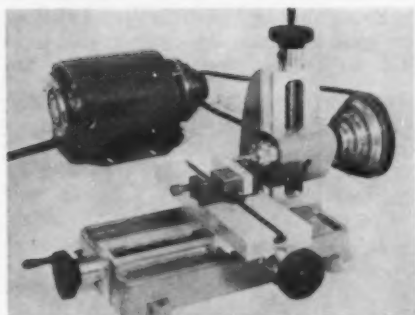
Outstanding, powerful, fast-cutting tools of proven high efficiency. Designed for tough jobs and real production. Perform indefinitely and dependably. Precision made. Steel housing for safety. Also other models.

WRITE FOR LITERATURE

M-B PRODUCTS
46 VICTOR AVE., Div. 23
DETROIT 3, MICHIGAN

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MACHINE and TOOL BLUE BOOK



lead screws and micrometer dials calibrated in thousandths. The 9 $\frac{3}{4}$ " x 3"

table has a 6" travel and 4 $\frac{1}{4}$ " traverse travel. Unit drills and cuts gears as well as doing many other types of work.

Because of its compact 16" x 12" x 12" size and its mechanical versatility, it is believed this milling unit will also be of interest to home craftsmen and hobbyists.

Various accessories for rotary table end milling, gear cutting, and other types of work are optional.

McKin Mfg. Co., 4223 Lincoln Blvd., Venice, Calif.

Use postpaid card. Circle No. 145

FREE

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NEW

16-page illustrated booklet

Vapor-from-paper STOPS RUST

Now, you can "mothball" your metal parts or products as easily as your wife protects her woollens. This new booklet tells how Ludlow VPI® Wrap cuts costs in shipping and storage. Read how other companies have saved by modernizing their preservation methods. It's FREE! Ludlow Papers, Needham Heights, Mass. Dept. MT-110.

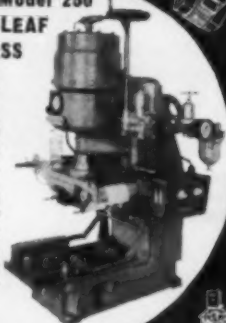


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"ENGINEERED" PRODUCTION MARKING EQUIPMENT

Model 250
ACROLEAF
PRESS

Dangerous
extended
parts elimi-
nated in this
advanced high
production
ACROLEAF
Press for
general purpose
use covering
wide range
of work.
Comes in sev-
eral sizes
Write for
full details.



PRECISION MACHINES
and ALL EQUIPMENT including
DIES, FIXTURES, CONTROLS, etc.



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CHINES are of more than 300
different kinds — each one devel-
oped for its specific field. STOCK
models are the ones most widely
used and adapted — but you'll get
the correct machine for the job
if you buy ACROMARK.

Write today for 1959 General Catalog,
fully indexed, covering over 500 marking
machines and tools, all originated and
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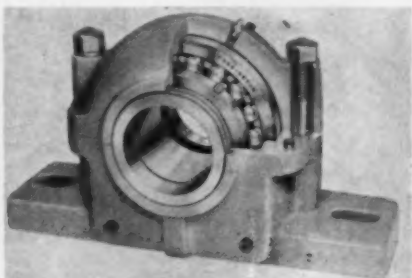
13 Morrell St., Elizabeth 4, N. J.

"The Original Marking Specialists"

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Roller Bearing Pillow Blocks

New heavy duty pillow blocks, with
self-aligning spherical roller bearings
in split housings, are now available in
143 sizes. The new pillow blocks are



Cutaway view shows split housing, spherical
roller bearing, and triple labyrinth seal.

ideally suited for a wide variety of
applications throughout industry.

Two heavy duty series are offered—
Series SAF, with two bolts clamping
cap to base, and Series SDAF, with
heavier castings and four cap bolts. All
sizes are available with straight bore
bearings for shouldered shaft mount-
ing, or with adapter bearings suitable
for mounting on straight commercial
shafting.

Housing seats are machined to bearing
widths plus $\frac{3}{8}$ ".

Housing design accommodates either
grease or oil bath lubrication and is
easily adapted to circulating or oil-
air mist systems.

The Torrington Co., Bantam Bearings
Div., South Bend 21, Ind.

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IMMEDIATE DELIVERY!

KNOBES LEVERS WHEELS & HANDLES



Cadmium plated, large selection of styles
and sizes. Specials on request. Send for
FREE catalog.

MACHINE PRODUCTS Corporation

6771 E. MUMFOLDS ROAD - DETROIT 12, MICHIGAN

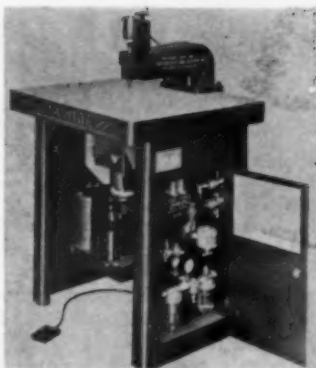
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MACHINE and TOOL BLUE BOOK

Machine Simplifies Circuit Board Drilling

The new Model 151 circuit board drilling machine is claimed to drill more than 64,000 holes per shift and to eliminate tedious hand drilling of printed circuitry. The machine drills holes from .020"-250" dia. Each hole can be within .001" of true position and minimum wall thickness between holes is .004". Circuit boards can be drilled individually or a stack of five can be drilled simultaneously. Unit features a woodpecker action that cleans out chips as it drills.

Foot controls free the operator's



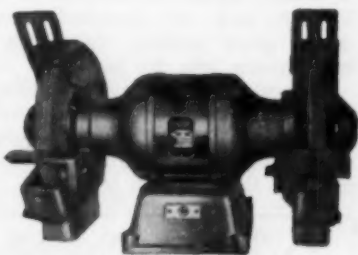
makes
tough grinding
jobs *Easy!*

BALDOR

MODEL 183-10"

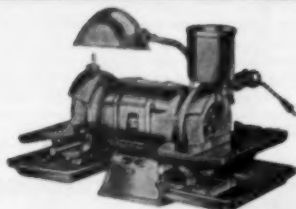
Rugged! Every part oversize to give years of dependable, trouble-free service—even on the most difficult grinding jobs. Ideal for use on large, odd-shaped pieces. Other outstanding features include:

- Rugged $\frac{3}{4}$ HP Baldor motor won't burnout even if repeatedly overloaded!
- Big $\frac{7}{8}$ " arbor . . . extra large ball-bearings!
- Wide-clearance construction provides more working room!
- Dynamically-balanced rotor plus patented wheel balancing process, reduce vibration to a minimum!
- Big 10" fast-cutting, long-lasting wheels!



One H.P.—single phase
or three phase—\$162.00.

CARBIDE TOOL GRINDER



Model 153-6". Reversible $\frac{1}{2}$ HP motor, 3450 RPM. $1\frac{1}{2}$ " wide wheels. Every part oversize for rugged, long-lasting use. Just \$201.80

Write today for Bulletin 321P on complete line of Baldor Grinders and Buffers!

BALDOR ELECTRIC CO.

4353 DUNCAN AVE.

ST. LOUIS 10, MO.

Use postpaid card. Circle No. 399

hands, allowing templates and stacked circuit boards to be rapidly maneuvered.

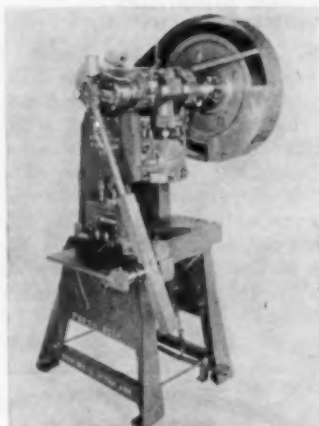
Nawide Machine Tools, Div. of Nationwide Engineering Service, Inc., 6138 Washington Blvd., Culver City, Calif.

Use postpaid card. Circle No. 147

Press-Rite O.B.I. Press Features New Automatic Feed

Addition of an automatic feed and other improvements for their Model 20 Press-Rite O.B.I. power press has been announced by Haver Manufacturing Co. The new feed is a rack-and-pinion roll feed unit equipped with an overrunning clutch. It provides an unusually long feed advance of up to 5.8". A new air operated clamping device gives positive control of material going into the press.

General specifications on Model 20, automatic roll feed include: Width of feed rolls, 4½"; die line height, 2" minimum; feed length, up to 5.8"; material thickness up to 5/32".



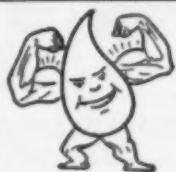
Standard equipment on all Press-Rite models (5 ton to 85 ton) includes: automatic cam actuated brake, non-repeat, single stroke safety mechanism, knock-out bar on slide, bronze bushed main bearings, antifriction roller bearings in flywheel, extra heavy ram, ramways and gibs, and double ramway lubrication.

Haver Manufacturing Co., 444 N. Cleveland, St. Paul 4, Minn.

Use postpaid card. Circle No. 148

Turret Indexing Machine Chassis

A heavy-duty turret indexing machine chassis provides intermittent motion for multiple-station automatic assembly operations. The chassis, known as the Series H, is a complete packaged chassis including motor, drive



Put Muscles In
Your Lubricants

MOTOR MICA

ANTI-FRICTION
COMPOUND

A clean white powder. Improves cutting oils. Dies last longer. Solves tough lubrication problems. Ask for free samples.

SCIENTIFIC LUBRICANTS CO.
3469 N. Clark St. Chicago 13, Ill.

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TAP BUSHINGS

Drives all standard taps from No. 0 to 1¼" and pipe taps from ½" to 1" Five o.d. sizes.

LESS TAP BREAKAGE
LESS TAP WEAR

Write for Bulletin

BYCO INDUSTRIES

2201 Snelling Ave. Minneapolis, Minn.

Use postpaid card. Circle No. 401

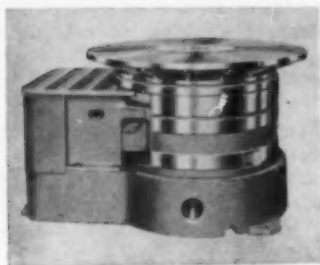


DRILL THESE HOLES

BY A QUICK, EASY, INEXPENSIVE METHOD
Your business letterhead will bring literature
WATTS BROS. TOOL WORKS
Wilmerding, Pa.

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MACHINE and TOOL BLUE BOOK



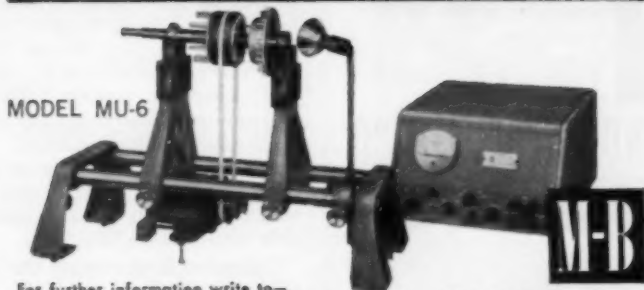
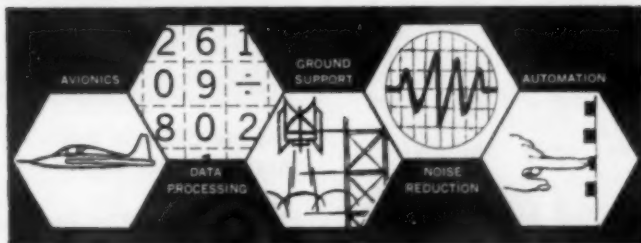
and clutch, and is intended as a basic unit around which special automatic machines can be designed and built. A wide selection of speeds, turret diameters, and index positions make the Series H readily adaptable to a broad group of automatic assembly and processing operations.

The index/dwell sequence is accomplished by means of a cross-over cam which engages cam followers mounted

SUPER SENSITIVE MU-6

takes the mystery out of
dynamic balancing

- High precision at no extra cost
- Sensitive to one micro-inch
- Balances over wide speed range
- Rotor weights up to 100 lbs.
- Use to balance-test rotors, impellers, armatures, drums, etc.



For further information write to—
MICRO BALANCING INC., Herricks Rd., New Hyde Park, L. I., N. Y.
West Coast Representatives: Electronic Balancing Co., Long Beach, California

Use postpaid card. Circle No. 403



IT'S A FACT

YOU CAN DO BETTER WITH



TOGGLE CLAMPS

LIKE THE NEW MODEL 630, a medium duty plunger type that locks in either push or pull position—has holding pressure of 1600 lbs. Solid one-piece forged base—large diameter bearings—flared end heavy Vinyl-covered safety handle.



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DETROIT STAMPING COMPANY

980 MIDLAND AVENUE
DETROIT 3, MICHIGAN



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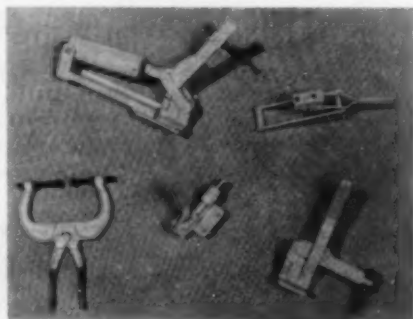
on the underside of the index table. During the dwell period, the turret is positively locked by a hardened steel block, assuring alignment accuracy and extra stability during the work cycle.

Featured is an extension of the main index camshaft, providing a means for mounting operational cams to actuate tooling or for mounting timing cams for electrical initiation of tooling sequences.

The standard chassis is furnished with 6 to 32 work stations and turret diameters range from 48" to 72".

Swanson-Erie Corp., 814 East Eighth St., Erie, Pa.

Use postpaid card. Circle No. 149



Toggle-Clamps Have Positive Action W/Minimum Force

A complete line of toggle-action clamps, called Uni-Klamps, is engineered to give positive action with a minimum of force required for locking or unlocking. The clamps incorporate features recommended by independent tool designers, process engineers, tool makers, and machinists. In addition to the toggle-action clamps, Universal markets a complete line of push-pull clamps, portable clamps, and air-operated clamps with clamp pressures available from 200 to 1200 lbs.

Universal Engineering Co., Frankenth, Mich.

Use postpaid card. Circle No. 150



Takes only 14½" x 24" space.

Container W/Disposable Cradle For Johnson's Wax Products

A 12-gallon container, called the Mini-Drum, is available for four of Johnson's Wax metalworking products and a number of maintenance products. The container will be used for 700 Wax-Draw, a wax drawing lubricant; Cold Stream and TL-131, water soluble coolants, and 180 Machine Cleaner, as well as building maintenance products such as waxes, finishes, cleaners, and insecticides.

A disposable drum cradle is included free of charge with each container. The container has the advantage of a non-spill pouring spout.

S. C. Johnson & Son, Inc., Racine, Wisconsin.

Use postpaid card. Circle No. 151

3 WAY PRECISION TEST INDICATOR



Indicates in thousandths with repeated accuracy • Rust proof non magnetic movement on life time conical bearings • Total reading in any direction .014"

Price \$9.00 plus .19 postage.

WRITE FOR BROCHURE

J. R. Reich Mfg. Co.
P.O. Box 2152 Dayton 29, Ohio

Use postpaid card. Circle No. 404

November, 1960

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SPACING PRODUCTS

... Such as ARBOR SPACERS, SHIMS, SHOULDER-SCREW SPACERS and SPACING COLLARS—extra precision manufacturing and finishing—packaged in popular diameters and thicknesses.

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380 MIDLAND AVENUE
DETROIT 3, MICHIGAN



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Plain Type

TRADE

AUTOM

MARK

Offset Type

CONTINUOUS HINGES

All hinges shown can be furnished with special holes, cutouts and bends to blue-print in metals to suit the job.

THREE-FOURTHS
OFFSET

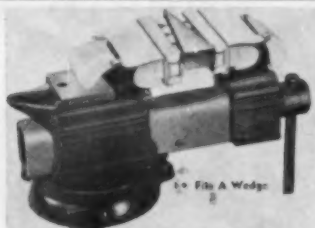
**AUTO Moulding
& MFG. CO.**
1110 E. 87TH ST.
CHICAGO 19, ILL.

Use postpaid card. Circle No. 406

SPECIFICATIONS

Open width $\frac{1}{8}$ " to 6"
Gage Material .040 to .187"
Pin Diameter .093" to $\frac{1}{16}$ "
Lengths to 120"

SEMI-OFFSET



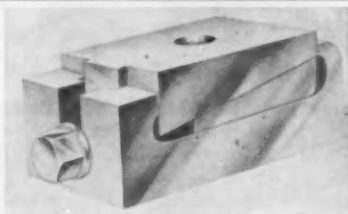
Universal Vise Grips Round, Angular, Irregular Shapes

Uni-Grip auxiliary vise jaws convert machine vises instantly into universal vises to grip and clamp steel balls, wedge shapes, vertical and horizontal pipe and rods, and irregular shapes. The faces of the jaws are steel wedges, which automatically conform to varied shapes.

The vise jaws are offered for 4", 5", and 6" vises, and are priced under \$25.

Mid-American Import Co., Inc., Suite 3, Brown Bldg., 939 Grant St., Denver 3.

Use postpaid card. Circle No. 182



Leveling Jacks With Capacities to 20,000 Lb.

A new series Empco Style J-H adjustable leveling jacks, with capacities to 20,000 lb., provide for precise level installation of machine tools. They permit up to $\frac{1}{4}$ " vertical adjustment. Two inter-acting inclined planes give smooth upward or downward control without lateral movement. Vertical motion of the top plate eliminates shifting or imbalance caused by vibration or stress on machine legs.

Enterprise Machine-Parts Corp., 2732 Jerome, Detroit 12, Mich.

Use postpaid card. Circle No. 153



DYKEM STEEL BLUE

Stops Losses

making Dies and
Templates

Popular package 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

Write for sample on company letterhead
THE DYKEM COMPANY
2301G North 11th St. • St. Louis 6, Mo.

With DYKEM Steel Blue



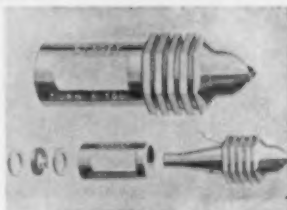
Without DYKEM Steel Blue



Use postpaid card. Circle No. 407

Design Permits Rotation of Entire Diamond Tool

The Turn-A-Tool design provides an easy, practical way to keep the diamond sharp by turning the tool from 0° to 360° as required by the operator. The design permits turning of the entire tool within a fixed shank. This means absence of wear at the bearing surface and trouble-free tension. The design uses the entire tool and can be applied to all diamond tool styles and a complete range of diamond weights in single point, multiple point, or cluster diamond tools. Staset Co., Inc., West Orange, New Jersey.



Use postpaid card. Circle No. 154

Easy Operation, Precision Measurements ...with Wilson "Rockwell" Hardness Testers

No matter what your hardness testing requirements are, there's a Wilson Rockwell instrument to do the job easily and accurately. Wilson instruments on the production line and in the laboratory offer these advantages:

Accuracy—Precision-built, with exact calibration, for consistently correct results.

Easy operation—Even an unskilled operator can get perfect readings. All controls conveniently grouped.

Long life—Simple design, rugged construction make Wilson instruments as durable as a machine tool.

Easy maintenance—Interchangeable mechanisms, with spindles mounted in oil-less bearings.

Complete line—Choose from the widest variety of instruments available, including semi and fully automatic models and Wilson "Brale" diamond penetrators.

Write for details—Ask for Catalog RT-58. It gives complete information on the full line of Wilson Rockwell hardness testers and accessories.



WILSON "ROCKWELL" HARDNESS TESTERS

Wilson Mechanical Instrument Division
American Chain & Cable Company, Inc.

230-T Park Avenue, New York 17, New York

Use postpaid card. Circle No. 408





Portable Punch Riveter

A riveting machine, that is said to operate 11 times as fast as existing methods, is described as the world's first portable punch riveter. The device performs all operations automatically in less than two second. This includes punching the hole, placing the rivet

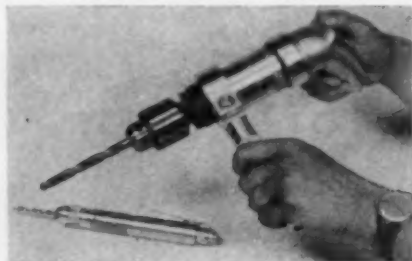
and heading. The riveter holds approximately 500 flush- or round-head rivets.

The Erco machine has many applications for automatic punching and riveting work that cannot be handled on stationary riveters.

The 50 lb. riveter is a $\frac{1}{8}$ " machine, of the pneumatic squeeze type. Models for other sizes also will be available.

ACF Electronics Div., ACF Industries, Inc., Riverdale, Md.

Use postpaid card. Circle No. 155



Compact Air Drills

A variety of 30 pneumatic drills, including miniature, angle, close corner, 360°, 90°, 30°, twin spindle, rack feed, straight and pistol grip units, are now offered by Newage Industries, Inc., Jenkintown, Pa.

The SR6 ($\frac{1}{2}$ " capacity) comes equipped with a removable side handle. The small diameters of Desoutter straight drills enable them to be grouped very close—down to 2" centers. The miniature drill, weighing 10½ oz. with $\frac{1}{16}$ " capacity, is no bigger than a cigar. This miniature unit is excellent for close fine multi-drill operations.

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BALANCED ALLOY LEAD HAMMERS

HANDLES AND MOULDS

1, 1½, 2½ and 5 lb. sizes—order your alloy lead hammer requirements from your mill supply house.

or direct from:

KITZMAN MFG. CO.

Manufacturers Of Lead Hammer Products
15061 Hartwell Ave. Detroit 27, Mich.

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Model
UL 7120

The Leading Machine
Tool Manufacturers
use

RUTHMAN GUSHER COOLANT PUMPS

THE RUTHMAN MACHINE CO.
1816 Reading Rd. Cincinnati Ohio

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JIG GRINDING and JIG BORING to your specification

All your disposal: Our sub-contract jig boring department, one of the best equipped in the East.

A. K. TOOL CO., INC.

ROUTE 22, MOUNTAIN SIDE, N. J.
Telephone: ADams 7-7300, DIgby 9-1445, N. Y. C.

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MACHINE and TOOL BLUE BOOK

Low Temperature Air-Hardening Die Steel

In addition to its free-machining qualities, this AISI grade A-6 tool steel, trade-named Orbit, combines many of the advantages of air-hardening grades with the low hardening temperature of oil hardening grades. It is stated that its hardening temperature is low enough so it may be heat treated without using expensive furnaces.

The manufacturer also claims that the tool steel's free-machining properties give it 40% better machinability than conventional oil hardening steels used for the same type of dies. In addition, it is at least 10% tougher than these oil hardening grades.

The Crucible Steel Co. of America, Pittsburgh 22, Pa.

Use postpaid card. Circle No. 198

Portable Transistorized Vibration Meter

A new, battery-operated, hand-carried vibration meter with high gain, transistor circuitry, reads peak amplitudes of both absolute and relative vibrations directly on its large meter dial. This type PR-9252 can be used wherever vibrations must be measured or monitored. Unit simplifies scheduling of machinery maintenance.



Readings are in microns, over its 5 cps to 1200 cps frequency range. It has a measuring range from 0 to 1000 microns value (0.039") in five steps, and a sensitivity down to 0 to 10 microns full scale (0.00039").

A special terminal connects meter's output into an oscilloscope or high speed recorder for making permanent records.

Korfund Co., Inc., Dept. 39W, Cantiague Rd., Westbury, N.Y.

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Another

VICTOR VALUE

TOP QUALITY—LOWEST PRICES

Our Special Import . . .

DIAMOND WHEEL DRESSERS

Made of selected, full individual stones, mounted in 7/16" diameter x 6" long cold rolled shank.

Karat	Regular Price	Our New Price
1/4	\$ 6.00	\$ 2.85
1/2	12.00	5.00
3/4	21.00	7.50
1	30.00	10.25
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2	75.00	20.00
2 1/2	102.00	26.00
3	130.00	32.00

These diamonds can be set in any shank to your specifications for \$1.00 each extra.

Order Today—Immediate Shipment from Stock!

VICTOR MACHINERY EXCHANGE, INC.

Dealers in Tool Room Equipment

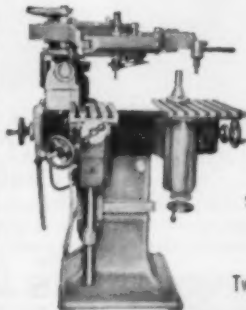
Dept. B, 291 Centre St.

New York 13, N.Y. Tel.: CAnal 6-5575

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ALEXANDER die sinkers

for 2 or 3 dimensional work



Latest model No. 3A for molds and dies up to 1000 lbs. Ratios from 1.5:1 to 10:1, 14 spindle speeds from 475 to 9500 rpm, cutters up to 3/8" dia. Two smaller sizes, 1A and 2A

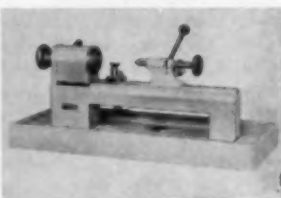
Write for Catalog A on these quality, British machines.

J. ARTHUR DEAKIN, INC.
31 ROSELAND AVE., CALDWELL, N.J.

Use postpaid card. Circle No. 382

Instrument Lathe With 1/2" Collet Capacity

A new instrument lathe has the sensitivity of the firm's regular instrument lathes, but with a collet capacity of 1/2". It is intended for use with parts that are fairly large but require delicate operations. The enclosed headstock is driven by a V-belt by 1/4 hp motor provided with a stepless speed control. Spindle speeds from 0 to 4000 rpm are obtained. A foot switch starts and stops, and also controls optional coolant pump. Unit can be furnished as for micro-drilling or as a turret lathe for second operation work. Accessories are available. Louis Levin & Son, Inc., 3610 S. Broadway, L.A. 7.



For use with parts that are fairly large, but require delicate operations.

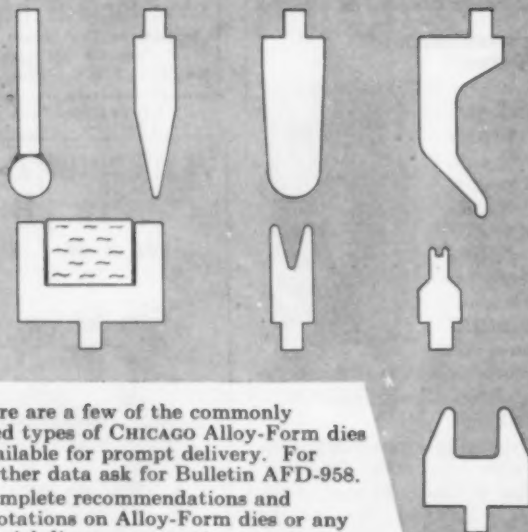
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Alloy Forming for

AIRCRAFT
MISSILES
ROCKETS
and
OTHER FABRICATIONS

CHICAGO ALLOY-FORM DIES

For All Makes of Press Brakes



Here are a few of the commonly used types of CHICAGO Alloy-Form dies available for prompt delivery. For further data ask for Bulletin AFD-958. Complete recommendations and quotations on Alloy-Form dies or any special die upon request.



DREIS & KRUMP
MANUFACTURING CO.

7440 S. Loomis Blvd., Chicago 36, Ill.

8741

Press Brakes • Press Brake Dies • Straight-Side-Type Presses
Hand and Power Bending Brakes • Special Metal-Forming Machines

Use postpaid card. Circle No. 413

Solid Rubber Grinding Wheel With Coated Abrasive Belt

The new solid rubber Mermac wheel, with coated abrasive belts, is being offered on Thor 6" air grinders. Centrifugal expansion of wheel holds the belt in position during operation. The self-cleaning belts, combined with the air grinders, are ideal for flat work and weld grinding. Grinders feature positive safety control—an over-speed control integral with the standard governor which guards normal speed controls. Grinders with Mermac or standard wheel are offered in speeds of 4500 or 6000 rpm in 6" cap.

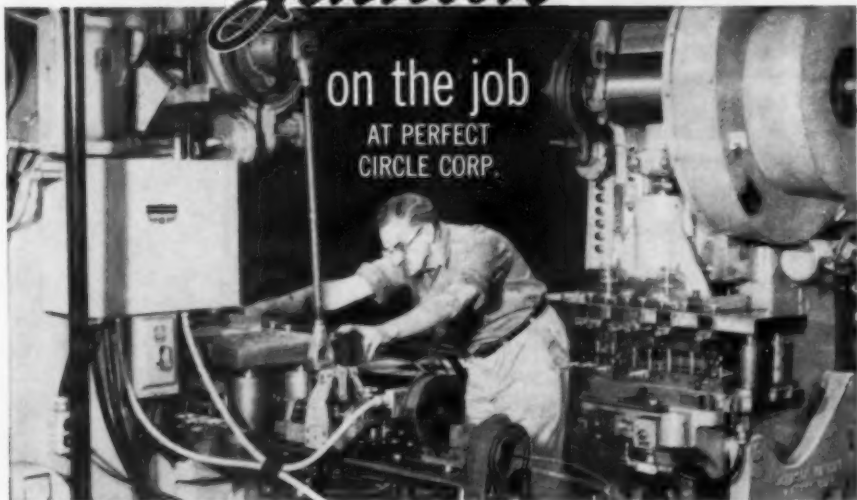
Thor Power Tool Co., 175 N. State, Aurora, Ill.

Use postpaid card. Circle No. 138



New wheel is shown on Thor grinder, with wheel's protective shield raised, and coated abrasive belt (left front) removed.

Johnson



From an interview at Perfect Circle Corporation: "The ability of our Johnson presses to do multiple operations simultaneously has resulted in an increased production of 20%."

Special presses built to order.



50 models of Johnson Presses

INCLINABLE • STRAIGHT SIDE • GAP • HORN



You will find the information you want on the complete Johnson line right at your fingertips in this easy-to-use catalog. Be sure to have your file copy on hand—Write for Catalog 1960.

JOHNSON MACHINE & PRESS CORP., 620 W. Indiana Ave., Elkhart, Ind.

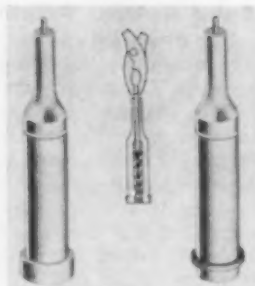
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Grinding Time Reduced With Punches

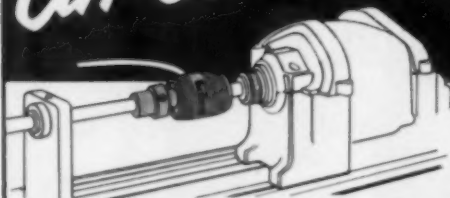
New Pull-Pin ejector punches greatly simplify grinding of these die components. The job of disassembly of punches or removal of stripper plates is eliminated. Ejector pin is removed from the new punch with pliers. Then, punch is sharpened and pin is simply pushed back in. The distance pin extends is set automatically. These punches, of M-2 high speed steel, are available in all point shapes, head or ring-types, with 3/16" to 1" dia.

Ring Punch & Die Div., The Product Machine Co., 19 Fenton Place, Jamestown, N.Y.

Use postpaid card. Circle No. 159



SET UP TO *Cut Drilling Costs*



SEALOL GUN DRILL ADAPTOR

— puts a modern gun drilling
machine in your plant or
shop for \$300 or less.

Convert solid spindle lathes, boring, drilling or milling machines for precision gun drilling. Sealol's Gun Drill Adaptor directs coolant to cutting edge where it is essential. Rotational speeds to 10,000 rpm — pressures to 1,000 psi. Type EL unit (not shown) attaches to outboard end of hollow-spindle equipment to transfer coolant to rotating gun drill.

Send for your free copy of "An Introduction to Modern Gundrilling" and bulletin information.



SEALOL INC.

2111 Post Rd. • Providence 5, R. I.

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MAGNA-SINE (Magnetic)



SINE PLATE (Non-Magnetic)

EX-CELL-O
CORPORATION

Greenville Plant, 945 E. Sater St., Greenville, Ohio



Speed, Accuracy, Savings on Every ANGULAR SET-UP

**Robbins Angular Tooling
Equipment Now Manufactured
by EX-CELL-O**

You can save hours of set-up time and be certain of accuracy on your angular grinding, other machining, and inspection operations with Robbins Magna-Sines and Robbins Sine Plates.

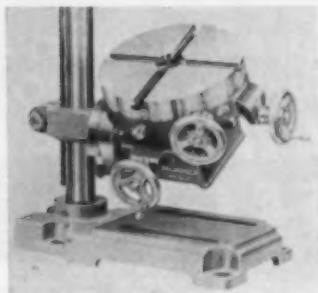
Any desired angle can be quickly and easily set up by using standard gage blocks. Referring to the handy Table of Constants supplied with each unit, it is simple to select the proper blocks. Accuracy of the set-up is then always to the gage block limits.

This simple, fast, sure method sets up all angles, single or compound, right or left hand, without V-blocks, angle plates or complicated "build-ups". Complete range of models and sizes in both magnetic and non-magnetic types puts Robbins precision equipment within the reach of every shop. Write now for complete catalog.

9082

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MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES
• CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS •
TORQUE ACTUATORS • CONTOUR PROJECTORS • GAGES AND GAGING EQUIPMENT
• GRANITE SURFACE PLATES • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS
• ATOMIC ENERGY EQUIPMENT • DAIRY AND OTHER PACKAGING EQUIPMENT



Drill Press Table With 360° Rotary Feed

New all purpose Palmgren No. 500 drill press table, which fits all popular size bench or floor model drill presses, is quickly installed on the drill press column. Table provides two cross slide movements together with 360° rotary feed and graduated tilting adjustment.



• Designed for fast precision • Engraved graduations simplify reading—Knife jaws for inside measurement, outside and depth measurements—can be locked in position—All operating components are completely enclosed • Precision built from stainless steel and brass • 4 Models: 6"—\$39.00, 8"—\$42.00, 12"—\$50.00, 24"—\$166.30.

WRITE TODAY FOR FREE LITERATURE

Dealer inquiries are invited

TITAN TOOL SUPPLY CO., INC.

Box T, 1419 Hertel Avenue • Buffalo 16, N.Y.

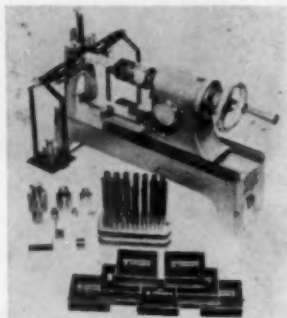
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Drilling, milling, grinding, and indexing can be performed without removing workpiece from the table.

Table diameter is 8" graduated 360°. Transverse and longitudinal travel is 4 1/4". Cross feed dials are graduated in thousandths. Rotary feed is positive with worm gear ratio of 40:1. Rotary dial is calibrated in three minute intervals.

Chicago Tool and Engineering Co.,
8383 S. Chicago Ave., Chicago 17, Ill.

Use postpaid card. Circle No. 160



Torsion Spring Tester Checks Loads & Deflections

This new tester checks loads and deflections of the small, medium, and average size torsion springs used in electronic devices, missile components, and instruments.

The tester can check springs having wire diameters from 0.005" to 0.1875", 1/16" to 6" O.D., 1/8" to 8" long, with



Multiform BENDER CUTTER

CUTS, BENDS, PUNCHES

Available in hand, air and hydraulic models, the MULTIFORM is shipped complete with full assortment of dies and mandrels to punch, bend and cut round or flat brass, bronze, aluminum, steel, etc., up to 1/4" x 1 1/2" as illustrated, other models up to 1/2" x 8".

J. A. RICHARDS CO.
KALAMAZOO, MICH.

Use postpaid card. Circle No. 418

torque from $\frac{1}{2}$ in. oz. to 80 in. lb. The large protractor dial shows each degree of deflection. 300 to 600 tests per hour can be made, it is reported.

Arbors and other accessories are provided with the unit.

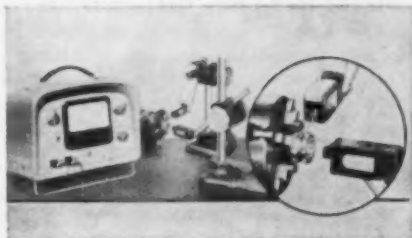
The Carlson Co., 3457 Weidner Ave., Oceanside, L.I., N.Y.

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Differential Gaging Without Precision Fixturing

High precision measuring, using basic equipment of two identical gage heads and a differential input amplifier, eliminates need for expensive, short lived mechanical fixturing. The manufacturer claims measurements can often be made under what were previously impossible conditions. With Cleveland differential gaging techniques, measurements cover such areas as concentricity, roundness, size, diameter, taper, etc.

The principle of operation is that of cancellation of the fixturing or environ-

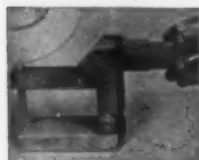


Typical applications include measurement of the true roundness of journals on parts weighing up to four tons while in the production machine, and concentricity of I.D. and O.D. of small bearings using non-precision spindles.

mental errors affecting the measurement so that only the desired dimension is indicated on the meter. It is stated these errors can be 100 times greater than the accuracy of measurement desired.

Cleveland Instrument Co., 6220 E. Schaaf Rd., Cleveland 13, Ohio.

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Low Price—\$124.56
Includes Diamond

SOMERSET TOOL CO. 244 Virginia St.
Hillside, N. J.

New 1966 Model "55" RADIUS DRESSER
Newly engineered and redesigned after 18 years of field testing. Convex, concave, or complex combination shapes are dressed quickly and easily by even inexperienced operators. Accuracy to .0002". Dresses all wheels up to 12" diameter. Write today for free illustrated folder.

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CAM MILLING

Fully equipped modern machine shop with extensive Jig Boring, Surface Grinding, Horizontal Boring, and Thread Grinding facilities as well as modern Cam Milling and Cam Grinding equipment.

Your Inquiries Answered Promptly

HIMOFF MACHINE CO., INC.
23-22 44th Road Long Island City 1, N.Y.

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November, 1960

Send your order for 1 gallon

CAMPBELLNE

Cool Blue

COOLANT

CONCENTRATE

FOR ABRASIVE CUTTING
AND GRINDING

\$3.90 per gallon

F.O.B. Bridgeport, Conn.
(large quantity prices on request)

Prove in use how much you'll profit from all these advantages—

- contains exclusive Odormask to reduce odors
- won't turn rancid—increases wheel life
- inhibits rust—economical

Address order to Dept. 8
Allison-Campbell Division
American Chain & Cable Company, Inc.
937 Connecticut Avenue
Bridgeport 2, Connecticut

Use postpaid card. Circle No. 421



Direct-Reading, Dial-Indicator Groove & Bore Gage

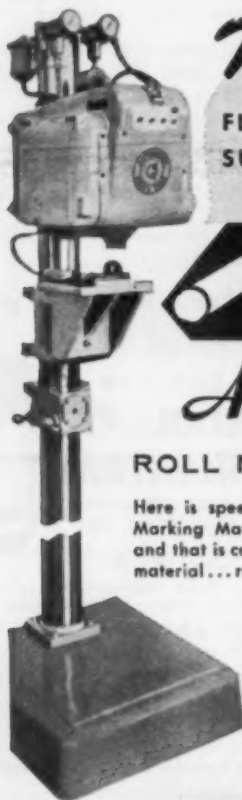
The new Truarc groove and bore gage measures I.D. of bores and housings, retaining ring grooves, O-ring grooves, and other internal recesses. Unlike zero-setting gages—which must be adjusted for each piece to be measured—the gage provides a direct reading on the indicator dial. Gage is calibrated in graduations of .001" or .0025", depending on size, and has a reach of 2 $\frac{3}{4}$ ". Four sizes accommodate .40" to 3.0" dias. Gage with equipment is priced at \$35.

Truarc Retaining Rings Div., Waldes Kohinoor, Inc., 47-16 Austel Pl., Long Island City 1, N.Y.



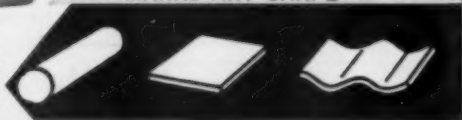
Four sizes accommodate .40"-3.0" dias.

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Now! MARK
FLAT, ROUND, CONTOURED
SURFACES *at* HIGH SPEEDS!

MARKS ANY SHAPE



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Automark®
(MODEL HRMA)
ROLL MARKING MACHINE

Here is speed, versatility and adaptability in a Marking Machine that operates by air pressure and that is controlled electrically. Marks any shape material... round, flat or contoured.

**CUTS PRODUCTION COSTS...
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The Automark operates at speeds up to 6,000 or more 1-inch strokes per hour, or 1,400 strokes per hour on stroke of ram and die slide combination. Think of all the saving in time and money with Automarks in your shop!

**AUTOMATIC FEEDS *and*
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Chuck Jaws Provide For Machining Accuracy

Custom-engineered, custom-built Grip-Lock line of chuck jaws is designed to fit any chuck of any lathe, turret lathe, miller, chucking machine or multiple spindle machine. Chuck jaws are said to provide for greater machining accuracy and better holding power of work, and increased production. Devices are for markets of automotive, aircraft, general precision manufacturing, etc. Company offers engineering assistance in chuck jaw designs made to American Standards. The Royal Machine & Tool Corp., 31 Deming Rd., Berlin, Conn.

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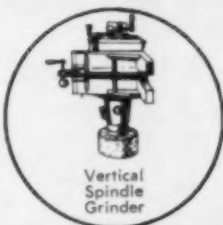
The Answer... TO INDUSTRY'S DEMAND FOR QUALITY, EFFICIENCY AND LOW COST ECONOMY UNITED STATES ELECTRICAL GRINDERS-BUFFERS



An investment in better, faster, production through the use of tools expertly designed and conscientiously crafted for your particular purpose.



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Grinder



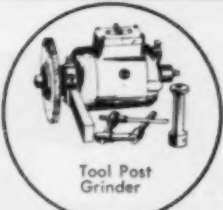
Vertical
Spindle
Grinder



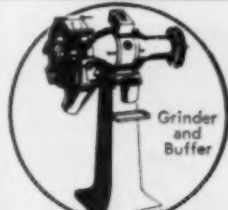
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Precision Lathe
Grinder



Tool Post
Grinder



Grinder
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Buffer

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RIVETER**



Cut production costs with the Linley. Quickly produces finely finished rivets. Takes rivets up to $\frac{3}{8}$ " in diameter in iron and cold rolled steel; even larger sizes in brass, aluminum and other soft metals. Send sample parts to be riveted and without obligation we will give you cost and time estimates of doing the job the easy Linley way.

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LINLEY BROTHERS CO.

Also Builders of Jig Bore
673 State St. Ext., Bridgeport 1, Conn.

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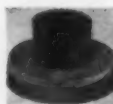
MACHINE TOOL DIALS



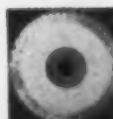
TYPE 1—The old standard for lathes, mills, shapers, etc. We can furnish in steel or aluminum alloy with steel hub with any numbering or graduation.



TYPE 2—Loose ring made of aluminum alloy with steel hub or all steel. Brass adjusting screw for friction or positive locking. Our favorite.



TYPE 3—This type is used on mills, shapers and special equipment. It has a wide, easy to read visual range. Made of aluminum alloy with steel hub or all steel.



TYPE 4—Flat face or slightly tapered, easy to read, made in aluminum alloy or steel.

M-D Can furnish dials for your machine tools. Duplicate or oversize dials made for your Lathes, Mills, Shapers and Special Equipment. Made to your specifications. Flat Face-Tapered-Standard and Slip Ring also Graduated in Degrees.



MD DIALS 815 N. CODY ROAD
LECLAIRE IOWA

Use postpaid card. Circle No. 459



Shape of the wheel permits holding the wheel at lower angle for better control.

Wheels Speed Weld Grinding

The new Koolie Hat grinding wheel, to speed weld grinding, is dish-shaped to permit holding the wheel at a lower angle to the work. The result is better control over the grinder.

The company claims the new shape reduces operator fatigue by eliminating jitter and bounce, with a resultant lowering of accidents. It is also stated that uniform wear of all three layers is assured and the wheel cannot wear thin, due to its dished shape.

The wheels are available in two diameters, 7" and 9", and are $\frac{1}{4}$ " thick.

Bay State Abrasive Products Co., Westboro 2, Mass.

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**READ TEMPERATURES
ACCURATELY
with**



**PYRO
SURFACE PYROMETER**

Send for FREE catalog No. 168.

PYROMETER INSTRUMENT CO., INC.
Bergenfield 3, New Jersey

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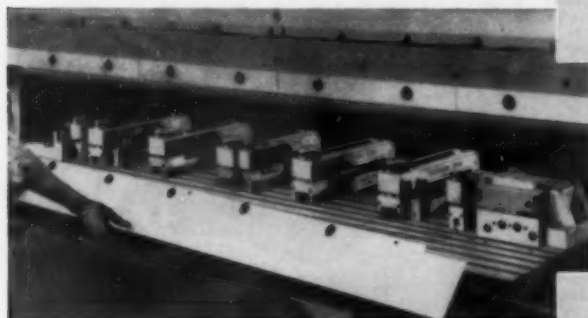
MACHINE and TOOL BLUE BOOK

UNIPUNCH

UNITIZED TOOLING for HOLE PUNCHING and NOTCHING

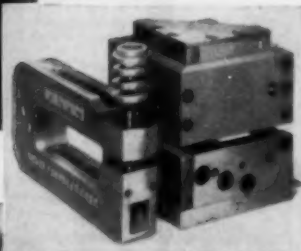


Set-up of Unipunch Series "A" Hole Punching and Notching Units on a template. Series "A" Units punch and notch up to $\frac{1}{8}$ " thick mild steel.

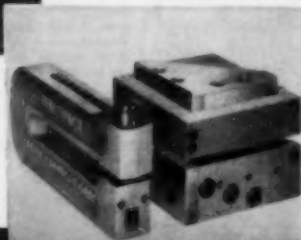


Set-up of Unipunch Series "B" Hole Punching and Notching Units on a T-slotted plate. Series "B" Units punch and notch up to $\frac{1}{8}$ " thick mild steel.

Unipunch Tooling System produces custom setups with standard units for punching and notching sheet metal. Set-up units outside press; slide onto press bed; and produce parts with first stroke of ram—nothing attached to press ram... no press downtime.



Unipunch self-contained Units permanently align punches and dies—no adjustments. Units are used and reused in press and press brake set-ups—no "dead" storage and no special capital equipment required for production of parts from sheet metal, plates, angles, channels or extrusions.



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PUNCH PRODUCTS Corporation

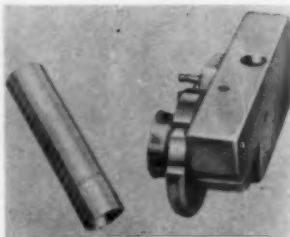
386 BABCOCK ST., BUFFALO 6, N. Y.

Exclusive Canadian Licensee: Wm. F. Brattin Associates, Hamilton, Ont.

Screw Machine Attachments

The new Sossner Rol-A-Matic is a high precision automatic screw machine attachment, designed for screw machines and light marking on turret lathes from one to six spindles. Unit can be attached to either front or rear cross-slide. It is used for imprinting round, hollow or solid stock. The advantages reported are versatility, ruggedness, simple construction, and low price of \$75.00.

Sossner Steel Stamps, Inc., 161 Grand St., New York 13.



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LW MILLING MACHINE VISES

- Super-Strong Flange Construction
- All surfaces ground for extreme accuracy
- Full length bearing on ground bar and machine ways
- Steel jaws
- Work holding surfaces are always at true right angles, or parallel to the table
- Large Acme steel screw with replaceable bronze nut.

The first wide range drill press vise that safely handles both rigid and non-rigid work without distortion. Quick action and adjustable pressure at the turn of a knob. Easy hand pressure on hardened and micro-ground bar locks and holds the work.

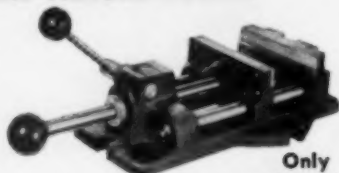
Precision-built to cut tooling costs and increase production. Heavy removable jaw inserts allow simple, quick adaption for low-cost jigs and fixtures.

Milling Machine vises available with or without base.



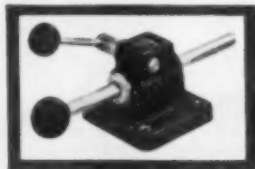
MOGUL	MASTER	JUNIOR
Jaws 1/2" thick, 3 1/4" wide and 2 1/2" deep	Jaws 1/2" thick, 6 1/4" wide and 2" deep	Jaws 3/4" thick, 4 1/4" wide and 1 1/2" deep
open 6" when in place. Wt. 140 lbs.	open 4" when in place. Wt. 90 lbs.	open 2 1/2" when in place. Wt. 40 lbs.
ONLY \$180.00	ONLY \$90.00	ONLY \$60.00

L-W ADJUSTO-QUICK CONTROL DRILL PRESS VISE AND FIXTURE HOLDER



Only		
4" Model	(3 1/2" Opening)	\$31.50
6" Model	(6 1/4" Opening)	\$44.00
8" Model	(8 1/4" Opening)	\$57

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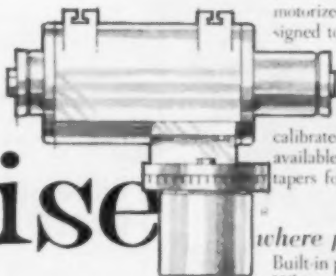
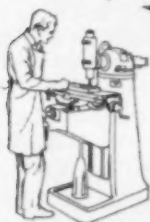
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MACHINE and TOOL BLUE BOOK

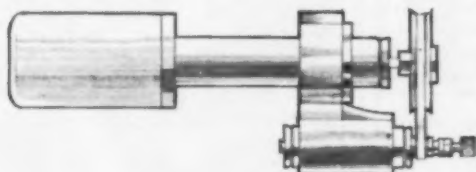
Whitnon spindles are truly

versatile



For instance, Whitnon's D-180 is a motorized, highly adaptable unit designed to mount on any model of the Bridgeport miller or on many makes of cutter grinders. The post centerline is adjustable, and the pivot is calibrated in degrees. Both ends are available with internal or external tapers for broad versatility.

precise



where precision counts

Built in precision is a habit at Whitnon, for greater production and longer life . . . even in the Whitnon high-speed attachment which enables most 6 x 18 surface grinders to do small contour grinding with remarkable efficiency. The attachment spindle is unusually short, and unusually close to the surface grinder spindle, for maximum over-table use both horizontally and vertically.



sealed-for-life

grease lubrication

Where practical, Whitnon spindles are grease lubricated and sealed for life — long, productive, trouble-free life, additionally insured by precision labyrinth seals and precision bearings. Convince yourself. Ask for Whitnon's useful catalog of precision spindle ideas.



spindles

The Whitnon Manufacturing Company, Route 6 and New Britain Avenue, Farmington, Connecticut. Specialists in the design and manufacture of precision revolving machinery. 24 hour repair facilities in Farmington and at The Whitnon Spindle Company, 20466 Wyoming Avenue, Detroit.



**DRILL and
PILOT
BUSHINGS**
Frictionless
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For core drilling, T. C. and high speed boring, turret tool, piloting, etc. Won't stick or clog. Dust proof as a watch. Write for details

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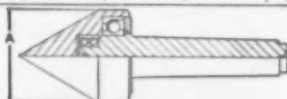
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LIVE CENTERS



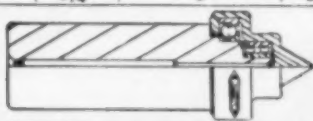
LIVE CENTERS

Head No.	Morse Taper	Price
2	2	\$28.00
3	3	32.50
4	4	40.00
5	5	52.00
6	6	75.00
7	7	295.00



TUBING CENTER SPECS.

Hd. No.	"A"	Morse Taper	Price
2	1 1/8"	2	\$32.00
3	2 1/8"	3	40.00
4	2 3/4"	4	43.00
5	3 1/4"	5	57.00



STRAIGHT SHANK CENTERS

Hd. No.	Shank Size	Price
3	1"	\$40.00
4	1 1/2"	53.00
5	1 3/4"	65.00
5	2"	75.00
6	2 1/2"	85.00

Head of any other size and shape can be furnished to spec. Standard shanks made with Morse tapers, other tapers special, always specify Head and Taper—4 page catalog on request.

STURDIMATIC TOOL COMPANY
3970 F St., DETROIT 16, MICH.

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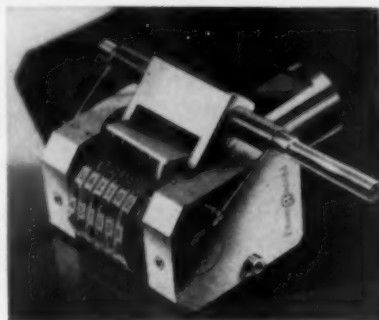
Photo-Mechanical Duplicating

A new process to produce thin sheet metal stampings with minimum die cost has been announced. Dayton Rogers photo-mechanical duplicating turns out any desired quantity of parts to close tolerances and free of burrs without the use of dies or stamping equipment. The company states that by this process it is possible to produce many intricate shapes at unusually low first cost.

Dayton Rogers Manufacturing Co.,
2824 13th Ave. So., Minneapolis 7.

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PRYOR

Automatic Numbering Heads for Permanent Metal Marking

Pryor Model "Z" numbering heads feature 6 fully tested automatic Sheffield tool steel wheels for clear distinctive consecutive numbering into metal. Precision accuracy, extra rugged construction and proven design assures rapid, dependable operation at all times. May be set for consecutive or repeat action. Available from stock for immediate delivery. 3 wheel sizes—1/16"—3/32"—1/8". Prices on request.

Write for literature describing other Pryor Marking Machines. Advise us of your numbering or marking problems!

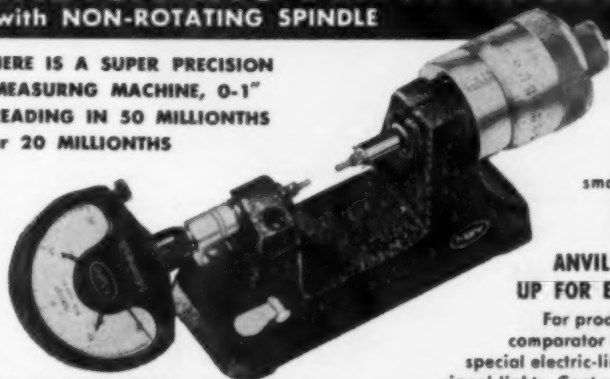
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MEASURING MACHINE, 0-1"
READING IN 50 MILLIONTHS
or 20 MILLIONTHS



only
\$192.50
Reading in .000050"

For measuring
and inspection of
small parts, choose from
**ELEVEN DIFFERENT
INTERCHANGEABLE
ANVILS, ASSURING A SET-
UP FOR EVERY APPLICATION**

For production inspection, the
comparator head is available with
special electric-limit contacts activating
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- Rapid anvil retraction for FAST GAGING

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TEST INDICATORS

I-D MODEL



A new concept in design and versatility. Salient features are: A stainless steel body, Anti-magnetic. Easier to read tilted dial, Automatic shiftless reversing, Carbide contact point. Greatly reduced contact pressure. Precise repetitive readings. 6 Models. Model 310-B1 is illustrated with 1½" dial and .0005" Div.

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*The how
and why of
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for special
operations..*

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... discussing in practical terms the problems involved in developing automatic machinery for specific operations such as assembly of components, packaging of individual products and a host of other applications. Valuable to both management and production personnel as well as designers and development engineers.



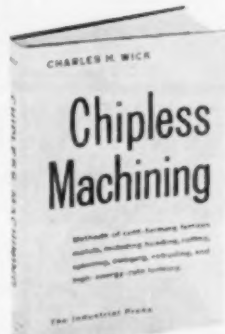
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machining... shaping metal parts
without the production of chips...*

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By Charles H. Wick

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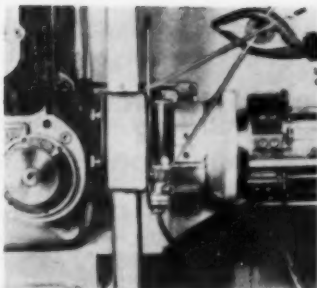
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Unsurpassed performance and endurance! Installation is easy! Just cut to shape and size you desire, from standard 18" x 18" squares; slip into position and then check the difference!

No bolts, cement or screws. FABCEL'S engineered, recessed suction cells lock machine to floor. FABCEL Pads also reduce noise and job rejects.

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- made by the makers of Fabreeka -

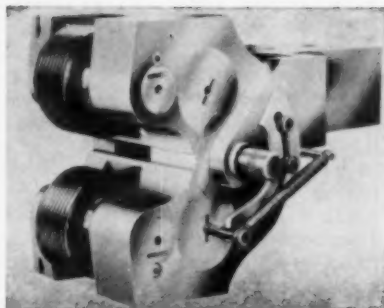
500 is for machines with standard or double vernier.

Stebar Co., 215-221 28th Ave. N.,
Minneapolis 11, Minn.

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Thread Rolling Attachment

A new Lanroll thread rolling attachment, the No. 28 GA, has recently been developed to roll a diametrical range from 1½" to 3¼". As with the other five sizes available, this attachment is applicable to turret and tracer



Even without pilots or finger stops . . .

"RFC" Automatic ROLL FEEDS*

**control feeding to
utmost accuracy**

REVERSES INSTANTLY

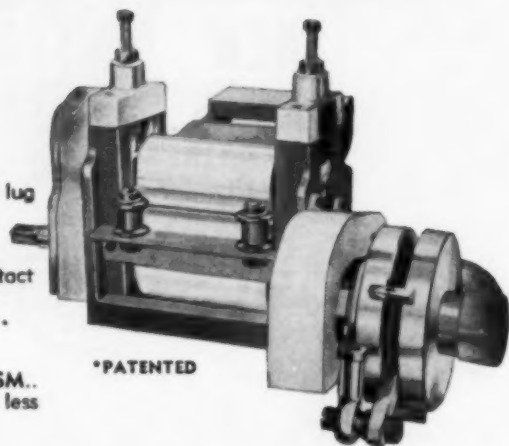
Shift Feed Finger spring from one lug
hook to opposite side

CAN'T SLIP

Each wedge has 4 points of contact

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PATENTED CLUTCH MECHANISM..
with fewer working parts for less
maintenance



Write for new brochure containing 39 standard feeds which are applicable to
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ALL WIDTHS, LENGTHS and THICKNESSES.

IMPORTANT: Please state make, type and tonnage of press when inquiring.



Roll Feeds Corp.

ASHTON, R. I.

MANUFACTURERS OF QUALITY FEEDS FOR POWER PRESSES

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lathes and to the larger automatic chucks and bar automatics. However, when it is applied to lathes, it must be used on machines equipped with power cross feed.

Helix angle bushings permit helix angle agreement between the thread rolls and the workpiece to eliminate thread drunkenness and also enable the rolling of threads up to and including a Class 4 fit.

All requests for application data should include a drawing, sketch, or exact sample of the workpiece, the material specifications, the complete thread specifications and the size, make and model of the machine to which it will be applied.

Landis Machine Co., Fifth and Church Sts., Waynesboro, Pa.

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GRAYMILLS *Superflo* COOLANT PUMPS

Years after the date of installation, the smooth, continuous performance of GRAYMILLS Superflo Pumps proves their rugged dependability. You install 'em and forget 'em. The abundant flow continues even after thousands of hours of continuous use. Top rated motors—simplified mounting and electrical connections—complete interchangeability with other makes—all adds up to quality. Specify GRAYMILLS Superflo Pumps for original equipment and replacement. They're sold by leading industrial distributors everywhere.

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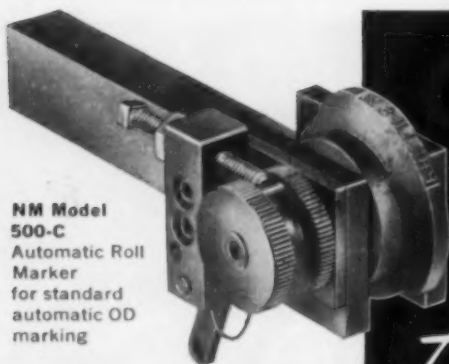


Two Spring Return Air Clamps

Two new spring return air clamps—Models ACM-110 and ACM-120—are respectively $1\frac{1}{8}$ " bore x 1" stroke and $1\frac{1}{8}$ " x 2". Holes are provided both in the body and the base for either horizontal or vertical mounting. Clamps feature U-cup piston packing and oil-type bearing for minimum friction. The ACM-110 is priced at \$7.75; the ACM-120, \$9.00.

Allenair Corp., 255 E. 2nd St., Mineola, N.Y.

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NM Model 500-C
Automatic Roll
Marker
for standard
automatic OD
marking

MARK YOUR PRODUCT

while it's being
machined...

Automatically

- Model 500-C operates like other screw machine tools—it *advances*; it *marks* the part; it *clears* it.
- Suitable for either light or heavy work on automatic screw machines and other multiple-station machines
- Eliminates any need for costly secondary setups
- Provides easy die change
- Many other practical advantages

OTHER NEW METHOD AUTOMATIC MARKER MODELS

Markers are available for different slides of different screw machines for OD marking. Also available are cut-off marking tools and end-face marking tools.

- New Method also manufactures a complete line of hand stamps and hand stamp products for any kind of marking on any surface, no matter what shape.

Write TODAY for Catalog MA-59



SINCE 1931

NEW METHOD STEEL STAMPS, INC.
147 JOS. CAMPAU • DETROIT 7, MICHIGAN

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MACHINE and TOOL BLUE BOOK

Oiler Lubricates Low Volume Short Stroke Air Cylinders

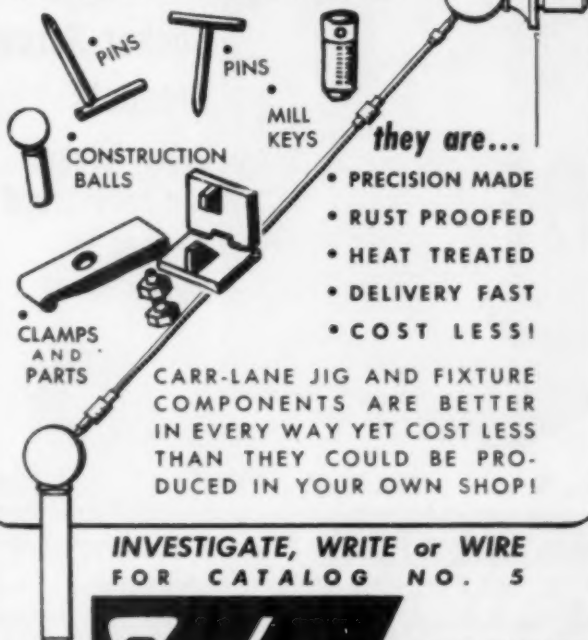
Designed specifically for use with low volume short stroke air cylinders, the new Watts No. 608 injection oiler is claimed to provide proper lubrication, stated to be previously impossible with ordinary mist-type lubricators. Installed in the pressure line between control valve and cylinder, the oiler delivers a controlled amount of oil directly to the cylinder. Oil is supplied to oiler from lubricator ahead of control valve or reservoir under pressure. Oiler is also in kit form.

Watts Regulator, Embankment Rd., Lawrence, Massachusetts.

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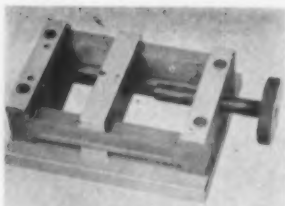
MEASURE THE *Value* OF THE MANY CARR-LANE JIG AND FIXTURE PARTS



INVESTIGATE, WRITE or WIRE
FOR CATALOG NO. 5

Carr Lane

MANUFACTURING
COMPANY
9244 SHORTRIDGE
ST. LOUIS 19, MO.



Meehanite base is $\frac{5}{8}$ " x $5\frac{3}{4}$ " x $7\frac{1}{4}$ ".

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4½" Precision Vise

Made for holding small workpieces, this all-steel vise has stepped jaws, eliminating the need for parallels. Vertical vee-groove in the sliding jaw securely holds round work. Capacity is $4\frac{1}{2}$ " x $4\frac{1}{2}$ ". The Meehanite base, for clamping, measures $\frac{5}{8}$ " x $5\frac{3}{4}$ " x $7\frac{1}{4}$ ". Threaded holes are provided in the fixed jaw for mounting of locating or positioning stops for production runs. An accessory for use with the Linley jig borer, the vise may be used on any machine.

Linley Bros. Co., 682 State St. Ext., Bridgeport 1.



Blue Devil®

**Socket Screw
Products**

**every "socket"
you need...and
no need to
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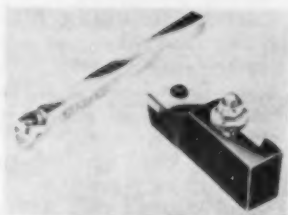
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A new line of boring bars, in a complete range of six sizes ($\frac{3}{8}$ " to $2\frac{1}{2}$ "), accommodates standard triangular carbide inserts. The boring bars are made from heat treated alloy steel.

A new profiling holder for carbide inserts gives 32° clearance for plunge cutting. The holder is furnished with fully adjustable carbide chipbreaker clamps and carbide shim, which protects the holder. Available for right- and left-hand turning.

Aloris Tool Co., Inc., Clifton, N.J.

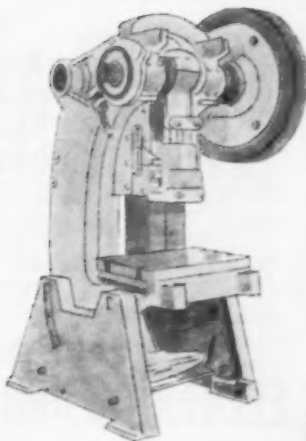


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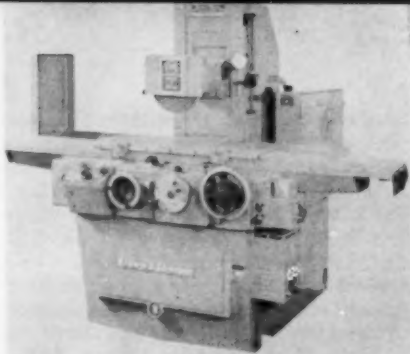
Dept. 810 Elkhart, Indiana

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Newly Designed & Larger Sized Surface Grinding Machines

Two newly designed and larger sized surface grinders—8" x 24" and 10" x 30" sizes—have been added to Brown & Sharpe's line of surface grinding machines. The smaller 5" x 10" and 6" x 18" sizes were announced during the last two years.

The vertical capacity has been increased to 14" with a transverse movement of 14" on the 8" x 24". Rapid power positioning at the rate of



150"/min. for both longitudinal and vertical movements is standard on the machine. The new design can be furnished with a 2 or 3 hp Oriflex drive to the spindle or with a 5 hp direct drive spindle. Plain or antifriction bearing spindles are available. Table speeds have been increased to 125 ft./min. and cross feed increment to 1/2" maximum.

Brown & Sharpe Mfg. Co., Promenade St., Providence 1, R.I.

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Buy safe "SHUR-GRIP"



drop forged HANDLES

Designed to hold 3 to 6 lb. lead hammer heads more firmly — will not slip — keeps hammer head in shape longer — makes remodeling easier, quicker, surer, less expensive.

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SPEED, POWER, STRENGTH and ACCURACY

These requirements for high speed production milling, drilling are found in this quick opening quick return vise. Saves designing and making expensive holding fixtures. Send for Specifications and prices.

PRECISION TOOL & MANUFACTURING CO., INC.
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CASE HARDEN TOOLS with KASENIT COMPOUND

Indispensable for Tool Rooms, Machine Shops, Schools, etc. Safe, easy-to-use. Now Available in 1, 5, 10, 25, 50 and 100 lb. containers.

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King St., Mahwah, N. J.
est. 1912

KASENIT CO.

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- WITH AUTOMATIC TEMPERATURE CONTROL
- AT REASONABLE PRICES

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November, 1960

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Directly from the Manufacturer
Made of Selected African Diamonds

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Karat	Price
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3/4	7.30
1	10.00
1-1/2	14.80
2	18.50
2-1/2	23.00
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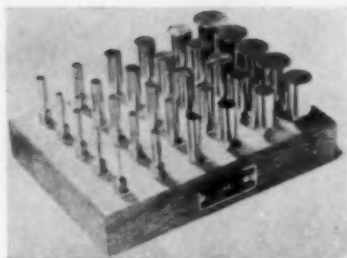
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Tracer Stylus Sets

The tracer stylus sets are for use with 360° and 3D duplicating and are available with round nose for ball end mill work or square nose for flat end mills. Each set contains 30 styli (.125 diameter to 1.062 diameter) and is packed in a hardwood case. Styli are hard chrome plated and come with .3750 shank diameter.

True-Trace Corp., 9824-30 Rush St., El Monte, Calif.

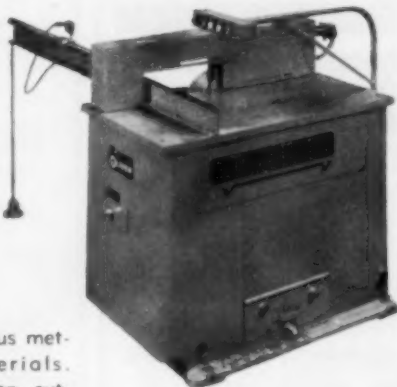
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Square nose type, Model 38F, is illustrated; round nose type, Model 38B, also available.

Extreme Accuracy— excellent safety features

"OLIVER" No. 296-D HYDRAULIC CUT-OFF SAW



Cuts non-ferrous metals and materials. Ideal production cut-off saw with high accuracy. Holds tolerances of plus or minus .001" in cutting magnesium extrusions 2" long. Features elaborate guarding around saw blade and assures deflection of chips below table. Heavy cast iron base casting gives greater capacity. Write for information.



OLIVER MACHINERY COMPANY
GRAND RAPIDS 2, MICHIGAN

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Trim H.D. cutting fluid and coolant was developed to eliminate many difficulties peculiar to heavy broaching, reaming, threading, and tapping. It is reported to do some of the toughest jobs on alloys, stainless and cast iron, yet doesn't stain brass or aluminum.

In some cases, i.e., for tapping punched holes, tap life has been reported as increased from two to four

times over that obtainable with straight cutting oil on high speed tapping operations. The very low viscosity of the fluid allows the fine chips to settle rapidly, whereas heavy oils hold the chips.

The manufacturer states there is no odor, no rancidity, no gumming, and no skin irritation with the translucent fluid.

Master Chemical Corp., 13 N. Huron St., Toledo 1, Ohio.

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Up To 10,000 psi Oil from Shop Air!

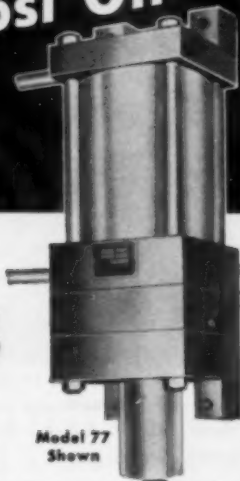


AIR TO
HYDRAULIC

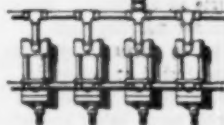
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No Pumps or High Pressure
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Hook a Miller Air-Hydraulic Booster to your air line and get INTENSIFIED (ratios up to 100 to 1) Hydraulic Power that you can vary and control at will and use for such common shop operations as punching, clamping, pressing, riveting, shearing, welding, crimping, testing, etc. High pressure booster output drives the hydraulic work cylinders and can be directly applied (without cylinders) in testing, measuring, other applications. Boosters save air, space, weight, require little or no maintenance, and hold pressure as long as desired without additional power consumption. Models for immediate delivery.



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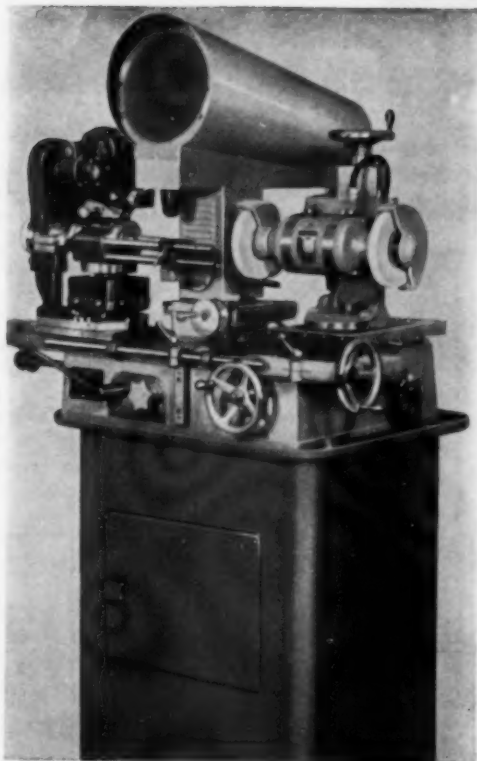
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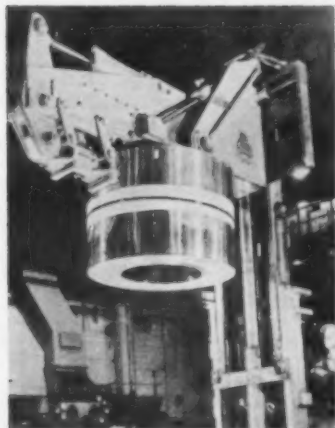
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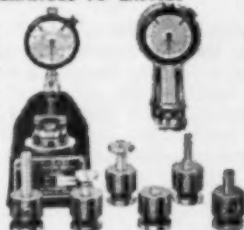
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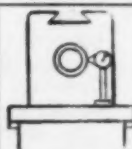
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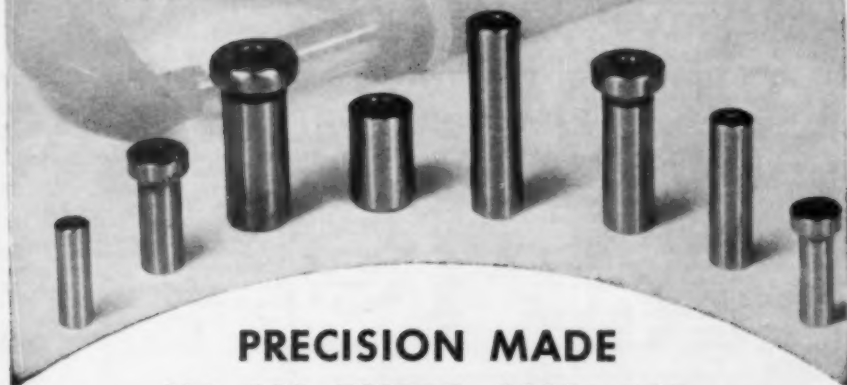
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SIZE	THREAD	SIZE	THREAD	SIZE	THREAD
00	96	15/32	32	1-3/4	5-8-10-12-14-16-18-20-24
0	70-72-76-80	1/2	12-13-14-16-18-20-24-27-28-32-36-40	1-13/16	6-10-12-14-16-18-20-24-32
1	48-56-64-72-80-88	9/16	12-14-16-18-20-24-27-28-32-36-40	1-7/8	5-8-10-12-14-16-18-20-24
2	40-44-48-56-60-64	5/8	10-11-12-14-16-18-20-24-27-28-32-36-40	1-15/16	5-6-8-10-12-14-16-18-20
4	32-36-40-48-56-60-64	11/16	10-11-12-14-16-18-20-24-27-28-32-40	2	8-10-12-14-16-18-20
5	30-32-36-40-44-48-56-64	3/4	10-11-12-14-16-18-20-24-27-28-32-36-40	2-1/16	12-14-16
6	30-32-36-40-48-56-60-64	13/16	10-12-14-16-18-20-24-27-28-32-36-40	2-1/8	8-10-12-14-16-18-20
7	30-32-36-40-48-64	7/8	9-10-12-14-16-18-20-24-27-28-32-40	2-3/16	10-12-14-16-18
8	24-30-36-40-44-48-56-60-64	15/16	8-9-10-12-14-16-18-20-24-27-32-40	2-1/4	4 1/2-8-10-12-14-16-18
9	24-28-32-36-40	1	8-10-12-14-16-18-20-24-27-32-36-40	2-5/16	12-14-16-18
10	28-30-36-40-48-56-60-64	1-1/16	10-12-14-16-18-20-24-27-32-36-40	2-3/8	10-12-14-16-18
12	20-22-24-28-30-32-36-40-56-60	1-1/8	7-8-10-12-14-16-18-20-24-27-32-36	2-1/2	4-8-10-12-14-16-18
14	20-24-28-32-40	1-3/16	8-10-12-14-16-18-20-24-27-32	2-5/8	8-10-12-14-16-18
1/16	60-64-72	1-1/4	7-8-10-12-14-16-18-20-24-27-32	2-3/4	4-8-10-12-14-16
5/64	72	1-5/16	6-8-10-12-14-16-18-20-24-27-32	2-7/8	8-10-12-14-16
3/32	36-48	1-3/8	6-8-10-12-14-16-18-20-24-27-32	3	4-8-10-12-14-16
1/8	32-36-40-44-48	1-7/16	8-10-12-14-16-18-20-24-27-32	3-1/4	8-10-12-14-16
5/32	32-36-38-40-44-48	1-1/2	8-10-12-14-16-18-20-24-27-32	3-1/2	8-10-12-14-16
3/16	20-24-28-32-36-40-48	1-5/8	12-14-16-18-20-24	3-3/4	4-8-10-12-14
7/32	20-24-28-32-36-40	1-11/16	6-8-10-12-14-16-18-20-24	4	8-10-12
1/4	14-16-18-22-24-28-27-28-30-32-36-40-56-64				
9/32	18-20-24-27-28-32-40-64				
5/16	16-18-20-22-24-28-27-28-30-32-36-40-48-64				
11/32	20-28-32-40-48				
3/8	12-13-14-18-20-22-27-28-30-32-36-40-48				
13/32	16-20-24-32				
7/16	12-14-16-18-20-24-27-28-32-36-48				

HIGH SPEED LEFT HAND TAPS

SIZE	THREAD	SIZE	THREAD	SIZE	THREAD
0	80	3/8	16-24-32	1-3/8	6-8-10-12-14-16-18-20-24
1	56-64-72	7/16	14-20-28	1-7/16	8-10-12-14-16-18-20
2	56-64	1/2	12-13-20-28	1-1/2	8-10-12-16-18-20
3	56	9/16	12-18-20-24	1-9/16	8-10-12-16-18-20
4	32-36-40-48	5/8	11-12-18-20-24	1-5/8	8-10-12-14-16-18-20
5	40-44	11/16	11-16-24	1-11/16	8-10-12-14-16-18-20
6	32-36-40	3/4	10-16-18-20	1-3/4	8-10-12-14-16-18-20
8	32-36-40	13/16	10	1-13/16	8-10-12-14-16-18-20
10	24-30-32-40	7/8	9-12-14-18-20	1-7/8	8-10-12-14-16-18-20
12	24-28-32	1	8-12-14-16-18-20	1-15/16	8-10-12-14-16-18-20
14	20-28-32	1-1/8	7-12	2	4 1/2-10-12
5/16	18-20-24-28-32	1-1/4	7-12-16-18		

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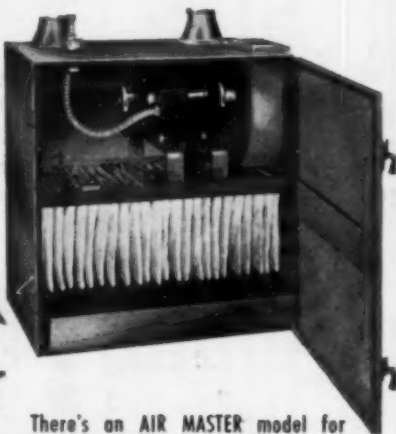
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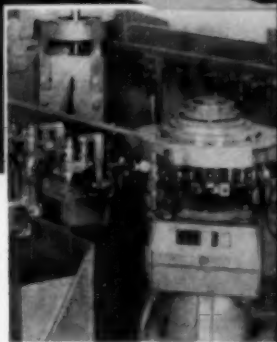
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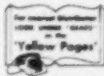
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